Sibling Bullying: Examining Childhood Precursors and Adverse Outcomes in Early Adulthood using a British Longitudinal Birth Cohort

by

Slava Dantchev

A thesis submitted in fulfillment of the requirements for Doctor of Philosophy in Psychology

University of Warwick, Department of Psychology

December 2018

Table of Contents

List of Tables

List of Figures and Boxes

Acknowledgements

First and foremost, I would like thank my supervisor Professor Dieter Wolke, without whom I would have never been able to accomplish this great journey. I am extremely grateful for his tireless efforts, guidance and continuous support throughout my PhD. I feel tremendously fortunate to have had the chance of working alongside someone, whose expertise, ideas and insights have been such a fantastic source of inspiration and provided me with endless opportunities for learning and growing both as a person and researcher in the past years.

Furthermore, I am incredibly thankful to my family. Mom, Ionko, Gogo and Grandma, you have unequivocally been my greatest support in moments of doubt or trouble and equally always stood behind me, celebrating every instance of success. I will forever be grateful to you all for making it possible to follow all my dreams and aspirations and encouraging me along every step of the way. You mean the world to me.

I would also like to thank the Department of Psychology at the University of Warwick for providing me with such a nourishing and supportive environment throughout all those years. I feel absolutely blessed to have been part of such a vibrant and inspiring department. It has been a privilege.

Last, I would like to thank all the families that took part in the ALSPAC study, the midwifes who helped recruit them and everyone else involved in the ALSPAC cohort. This PhD would not have been possible without you. Finally, a big thank you to my "data buddy" Rita Doerner, who always kindly assisted me with everything revolving around accessing and working with the ALSPAC dataset.

Declaration

This thesis is submitted to the University of Warwick in support of my application for the degree of Doctor of Philosophy. It has been composed by myself and has not been submitted in any previous application for any degree.

The work presented was carried out by the author except in the cases outlined below:

Data Collection

The data presented in this thesis has been collected and made available by the Avon Longitudinal Study of Parents and Children (ALSPAC).

Study One (Chapter Six): Under review at Developmental Psychology

Contributions:

- Dieter Wolke – planning, revisions

Study Two (Chapter Seven): Published in Aggressive Behaviour

Contributions:

- Dieter Wolke – planning, revisions

Study Three (Chapter Eight): Published in Psychological Medicine

Contributions:

- Dieter Wolke – planning, revisions
- Stanley Zammit – revisions

Inclusion of Published Work

Publications Incorporated Into This Thesis:

Dantchev, S., Zammit, S., & Wolke, D. (2018). Sibling bullying in middle childhood and psychotic disorder at 18 years: a prospective cohort study. *Psychological Medicine,* 14, 2321-2328. doi:10.1017/S0033291717003841

Dantchev, S., & Wolke, D. (2019). Sibling bullying at 12 years and high-risk behavior in early adulthood: a prospective cohort study. *Aggressive Behavior,* 45, 31-45. doi:10.1002/ab.21793

Dantchev, S., & Wolke, D. (2019). Trouble in the nest: antecedents of sibling bullying victimization and perpetration. *Developmental Psychology.* Advance online publication. doi:10.1037/dev0000700

Other Relevant Publications:

Wolke, D., Tippett, N., & Dantchev, S. (2015). Bullying in the family: sibling bullying. The *Lancet Psychiatry, 2,* 917-929. doi: 10.1016/S2215-0366(15)00262-X

Abstract

Sibling violence has been reported as the most frequent form of interpersonal violence. Still, sibling aggression remains an underresearched topic of developmental psychology and continues to be normalized by most parents and health professionals. There is emerging evidence suggesting an association between sibling bullying and a range of adverse consequences relating to mental health and wellbeing, however longitudinal studies using large and representative samples are scarce. Identifying the early childhood precursors involved in the development of sibling bullying is essential in order to reduce or prevent this problem behaviour from emerging.

This thesis used a sample of >6,900 children from the Avon Longitudinal Study of Parents and Children (ALSPAC), a prospective birth-cohort in the United Kingdom, in order to explore the early childhood precursors and some of the long-term consequences of sibling bullying in middle childhood. A set of three studies was conducted. Study one was designed in order to identify the developmental precursors of sibling bullying and compare the relative contribution of four sets of childhood precursors: (1) structural family characteristics, (2) parent and parenting characteristics, (3) early social experiences, and (4) child individual differences. Study two investigated the prospective association between sibling bullying and high-risk behaviour in early adulthood, while study three examined the link between sibling bullying and the development of psychotic disorder in late adolescence.

Findings revealed that sibling bullying was best explained through structural family characteristics (being the first-born and having older brothers) and sex (being male), reflecting an evolutionary model of sibling aggression. Parenting, early social experiences and child individual differences made smaller contributions. Furthermore, children perpetrating sibling bullying (bully-victims and bullies) were found to be at an increased risk for engaging in high-risk behaviour, while children engaging in any type of sibling bullying (victims, bully-victims and bullies) were found more likely to develop psychotic disorder. The theoretical framework leading up to the above-mentioned studies and findings are addressed.

Taken together, the findings presented in this thesis suggest that sibling bullying stems largely out of the evolutionary pressure to compete over resources and regain or acquire social dominance. Furthermore, the results suggest that sibling bullying may have serious consequences in the domains of high-risk behaviour and mental health, lasting into early adulthood. Parents and health professionals need to be made aware of the adverse outcomes of sibling bullying and educational programmes as well as preventative measures should be put in place in order to prevent the emergence of sibling aggression. Sibling bullying further needs to be placed more firmly on the research agenda and funding should be made available for the development of appropriate intervention studies. Both the practical and research implications are discussed in detail.

Abbreviations

ALSPAC	Avon Longitudinal Study of Parents and Children
ASBO	Antisocial Behavior Order
AUDIT	Alcohol Use Identification Test
BDNF	Brain-Derived Neurotrophic Factor
CAST	Cannabis Abuse Screening Test
CBCL	Child Behaviour Checklist
CI	Confidence Interval
CCEI	Crown-Crisp Experiential Index
DANVA	Diagnostic Analysis of Non-Verbal Accuracy
EPDS	Edinburgh Postnatal Depression Scale
FTND	Fagerstrom Test for Nicotine Dependence
GST	General Strain Theory
HPA Axis	Hypothalamic-Pituitary-Adrenal Axis
IQ	Intelligence Quotient
JVQ	Juvenile Victimisation Questionnaire
MSIC	Multiscore Depression Inventory for Children
OR	Odds Ratio
PLIKSi	Psychosis-Like Symptoms Interview
PRQ	Peer Relations Questionnaire
RCT	Resource Control Theory
RP	Regulatory Problems
SCAN	Schedule for Clinical Assessment in Neuropsychiatry
SDQ	Strengths and Difficulties Questionnaire
SLT	Social Learning Theory
SRQ	Sibling Relationship Questionnaire
TRF	Teacher Report Form
TSCC	Trauma Symptoms Checklist for Children
TSCYC	Trauma Symptoms Checklist for Young Children

CHAPTER ONE: Overview of Sibling Bullying

Overview: *The following chapter will provide a general introduction outlining the significance of the sibling relationship and laying the foundation for the next two chapters that will extensively review the antecedents and adverse outcomes of sibling bullying. The aim of this chapter will be to illustrate the general characteristics of the sibling bond and address the positive and negative influences that siblings may have on children's development. The focus will then shift on defining sibling bullying and discussing the issue of definition and prevalence.*

1.1 The Sibling Relationship

The large majority of children will grow up in a household with siblings. In the UK, around 85% of children have reported to grow up with at least one brother or sister (Tippett & Wolke, 2015). The nature of sibling bonds is special. Sibling relationships have been described as one of the longest lasting interpersonal relationships that an individual will experience throughout their lives (Dunn, 1984; Yucel & Yuan, 2015). By middle childhood, children will spend more time with their siblings than their parents (Fallon & Bowles, 1996; McHale & Crouter, 1996). Unlike peer relationships, where children may choose their friendships, siblings are obliged to spend an extensive amount of time with one another in the confined space of the home (Wolke & Samara, 2004; Punch et al., 2008). Children are thereby given little choice in respect to the time they share with their siblings. The relationship between brothers and sisters has further been described as emotionally ambivalent, consisting of intense positive and negative emotions (Dunn, 1984; Deater-Deckard & Dunn, 2002; Dirk, Persram, Recchia, & Howe, 2015). Taken together, the natural characteristics of the sibling domain provides children with the unique opportunity to mutually influence one another's development (Brody, 2004).

1.1.1 Trends in the Sibling Relationship Dynamic

The sibling relationship becomes more egalitarian, less asymmetrical and less intense throughout the transition from childhood into adolescence (Buhrmester & Furman, 1990; Dunn, 2002). Siblings have also been reported to spend less time in shared activities in adolescence compared to childhood (Buhrmester & Furman, 1990).

Coupled with children's increasing sophistication of problem solving abilities and perspective taking that develops with age (Ram & Ross, 2001), it may be unsurprising that sibling negativity is found to decrease with age (Dunn, Deater-Deckard, & Pickering,1999). Prevalence estimates of sibling victimisation across childhood and adolescence reflect this trend, with victimisation peaking between the ages of 2-9 years and subsequently decreasing between the age of 10-17 years (Tucker et al., 2013a).

1.1.2 Positive Sibling Influences

Conflict and warmth are both interdependent dimensions that are characteristic of the sibling relationship (Kramer, 2010). The coexistence of conflict and nurturance is an essential ingredient in fostering healthy sibling relationships and child development. Children reporting high levels of both warmth and hostility have for example been found to report more positive sibling relationships compared to children reporting high levels of hostility and low levels of warmth (McGuire, McHale, & Updegraff, 1996). Similarly, children reporting high levels of conflict and low levels of warmth demonstrate less emotional control and social competence compared to children reporting high levels of conflict and warmth (Stormshak, Bellanti, & Bierman,1996; Buist & Vermande, 2014). A balance between conflict and warmth may further promote the development of social, cognitive and emotional skills in children (Stormshak et al., 1996; Howe & Recchia, 2005; Yucel & Yuan, 2015) and facilitate social adjustment (Brody, 1998).

Siblings may act as confidants and socializing agents fostering and promoting the mastery of new skills (Bedford, Volling, & Avioli, 2000; Dunn, 1988; Deater-Deckard & Dunn, 2002; Hartup, 1989; Howe, Aquan-Assen, Bukowski, Lehoux, & Rinaldi, 2001). The sibling context provides the unique opportunity for children to interact and participate in bi-directional learning processes where they can assume the roles of teachers, learners, companions or caregivers interchangeably (Azmita & Hesser, 1993; Klein, Feldman, & Zarur, 2002). The mere presence of siblings in the same household has for instance been associated with improved development of theory of mind compared to children growing up with no siblings (Klein et al., 2002; McAlister & Peterson, 2013). Particularly younger children may benefit from the interaction with

their older siblings by observing, imitating and learning from them. Along these lines, older siblings have been reported to enhance their younger sibling's empathy (Tucker, Updegraff, McHale, & Crouter,1999) or contribute towards their cognitive growth (Azmita & Hesser, 1993; Klein et al., 2002; Ruffman, Perner, Naito, Parkin, & Clements, 1998). However, older children may equally benefit from their interactions with their younger siblings. Children who are involved in teaching activities with their younger siblings have been found to show enhanced language development and overall academic achievement (Smith, 1993). Similarly, first-born children's involvement in caretaking behaviour of their younger siblings has been associated with more skilled perspective-taking abilities in the context of a warm sibling relationship (Howe & Hildy, 1990).

Warm sibling bonds have further been reported to encourage constructive negotiation, problem solving and conflict resolution strategies (Ram & Ross, 2001; Recchia & Howe, 2009; Ross, Ross, Stein, & Trabasso, 2006). Cooperative and affectionate sibling relationships have been associated with children's emotional understanding of their self and others (Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991; Garner, Jones, & Palmer, 1994; Howe et al., 2001) as well as increased levels of empathy (Lam, Solmeyer, & McHale, 2012) and social competence (Kim, McHale, & Crouter, 2007). Moreover, positive sibling relationships may protect children from environmental liability (Dunn, 1996). Warm sibling relationships have previously been reported to act as a buffer for adjustment problems in the face of stressful life events (Gass, Jenkins, & Dunn, 2007); including bullying (Bowes et al., 2010), family environments marked by high-conflict (Caya & Liem, 1998) or parental divorce or remarriage (Dunn 1996; Kempton, Armistead, & Wierson,1991). Furthermore, supportive sibling relationships can also compensate for the lack of parental and peer support (East & Rook,1992; Milevsky, 2005; Coyle et al., 2017) in a child's life.

1.1.3 Negative Sibling Influences

While sibling conflict that occurs in moderation may have a positive influence on the development of children, conflict that dominates the sibling relationship and escalates into reoccurring aggression may result in adverse outcomes. There is now consistent evidence suggesting that sibling relationships marked by high levels of sibling conflict

and a lack of warmth are associated with increased levels of internalizing and externalizing problems (Buist, Deković, & Prinzie, 2013; Dirks et al., 2015). Evidence from a recent meta-analysis further indicated, that the effect sizes for internalizing (e.g. anxiety, emotional adjustment or depression) and externalizing (e.g. aggression, delinquency, or antisocial behaviour) problems were stronger for sibling conflict than for sibling warmth (Buist et al., 2013), highlighting the importance of addressing the negative aspects of the sibling relationship in particular. Children who experience more severe forms of sibling negativity such as sibling aggression, have furthermore been reported to experience more mental health problems (Tucker, Finkelhor, Turner & Shattuck, 2013b; van Berkel, Tucker, & Finkelhor, 2018), that may last into adulthood (Bowes, Wolke, Joinson, Lereya, & Lewis, 2014; Waldinger, Vaillant, & Orav, 2007).

Sibling relationships that involve high levels of conflict have further been linked to poor social adjustment (Bank & Burraston, 2004; Feinberg, Solmeyer, & McHale, 2012; Kim et al., 2007; Stormshak et al., 1996), with severe forms of sibling aggression translating into other social contexts. Sibling aggression or violence have been associated with more problematic peer relations and peer bullying (Duncan, 1999; Wolke & Samara, 2004; Tippett & Wolke, 2015) as well as more dating violence (Noland, Liller, McDermott, Coulter, & Seraphine, 2004; Sims, Dodd, & Tejeda, 2008). Moreover, sibling conflict or aggression has been found to predict the involvement in a range of high-risk behaviours including antisocial behaviour (Compton, Snyder, Schrepferman, Bank, & Shortt, 2003; Stormshak, Comeau, & Shepard, 2004; Snyder, Bank, & Burraston, 2005; Solmeyer, McHale & Crouter, 2014), delinquency (Buist, 2010; Criss & Shaw, 2005; Stocker, Burwell, Briggs, & Megan, 2002; van Berkel et al., 2018) and substance use (Button & Gealt, 2010; Tucker, van Gundy, Wiesn-Martin, Sharp, Rebellon, & Stracuzzi, 2015).

An exhaustive review of the literature and summary of studies exploring the adverse outcomes of sibling aggression can be found in chapter three.

1.1.4 Summary

In conclusion, the degree of sibling conflict and whether there exists a general warmth and acceptance between siblings appears to contribute to positive or negative outcomes in children. Siblings relationships involving moderate conflict may promote the development of a range of skills including social, emotional and cognitive competencies. Severe and persistent conflict within the sibling relationship, however may have serious adverse consequences for children's healthy development and wellbeing.

1.2 Sibling Bullying

While sibling aggression has been reported as the most frequent form of interpersonal violence (Finkelhor, Turner, Shattuck, & Hamby, 2015), aggression between siblings is still largely normalized and overlooked by parents and health professionals (Krienert & Walsh, 2011; Khan & Rogers, 2015; Pickering & Sanders, 2017). One of the greatest challenges towards investigating sibling aggression is the inconsistent use of terminology and the absence of an accepted uniform definition amongst scholars (Wolke et al., 2015a). Terminology including conflict, rivalry, aggression, violence, abuse or bullying have instead been used interchangeably (Finkelhor, Turner, & Ormrod, 2006; Tippett & Wolke, 2015a; Morrill, Bachman, Polisuk, Kostelyk, & Wolson, 2018; Toseeb, McChesney, & Wolke, 2018), making it difficult to measure this construct in a consistent manner. An overview of a range of sibling bullying measures used in previous studies can be found in Table 1.1. The sibling bullying measures outlined below illustrate the variability and the inconsistencies that exist within the current literature. The terminology, the timeframe during which sibling bullying was reported, the frequency, the cut-off points as well as the content of the measure used in the different studies are difficult to compare directly. More details, including the specific sibling bullying instrument used in the below-mentioned studies can be found in Table 1.2.

Table 1.1

Overview of Sibling Bullying Measures Used in Previous Studies

Study	Terminology	Timeframe	Frequency	Measure
Duncan (1999)	Sibling bullying	N/A	4-point Likert-scale. Sum-score; higher scores reflect higher frequency. Cut-off: At least "pretty often" for sibling bully groups.	Victimisation and Perpetration: (1) name calling; (2) picking on child; (3) hitting or pushing; (4) beating up child
Wolke & Samara (2004)	Sibling bullying victimisation	Past 6 months	5-point Likert scale: Never; Only ever once or twice; 2 or 3 times a month; About once a week; Several times a week. Cut-off: At least once a week.	Victimisation: (1) name calling; (2) making fun of child; (3) taking or damaging belongings; (4) hitting, kicking or pushing
Finkehlhor et al. (2006)	Sibling violence	Past 12 months	Chronic victimisation: ≥5 times/year.	Victimisation: (1) attacking with object; (2) attacking without object; (3) attempting to attack; (4) hitting; (5) hitting or kicking in private parts?

Table 1.1

Overview of Sibling Bullying Measures Used in Previous Studies

Study	Terminology	Timeframe	Frequency	Measure
Button & Gealt (2010)	Sibling violence victimisation	Past month	At least one behaviour reported as "yes".	Victimisation: (1) verbal abuse; (2) threats; (3) shoving/pushing/slapping; (4) fights: punching/kicking; (5) fights with threat/weapon.
Wolke & Skew (2011)	Sibling bullying victimisation	Past 6 months	4-point Likert-scale: never; not much; quite a lot; a lot. Cut-off: At least "quite a lot" for sibling bully groups.	Victimisation: (1) hitting, kicking or pushing; (2) taking belongings; (3) calling child nasty names; (3) making fun of child.
Radford et al. (2013)	Sibling victimisation	Past 12 months	At least one behaviour reported as "yes".	Victimisation: (1) Physical: hitting; (2) Emotional: picking on, chasing, grabbing or forcing child to do things; (3) Sexual: making child do sexual things.
Skinner & Kowalski (2013)	Sibling bullying	Retrospective	5-point Likert scale: Never; Only ever once or twice; 2 or 3 times a month; About once a week; Several times a week.	32 items

Table 1.1

Overview of Sibling Bullying Measures Used in Previous Studies

Study	Terminology	Timeframe	Frequency	Measure
Bowes et al. (2014)	Sibling bullying victimisation	Past 6 months	5-point Likert-scale: Never, Only ever once or twice; 2 or 3 times a month; about once a week; several times a week.	How often have you been bullied by a brother or sister?
Tucker et al. (2014)	Sibling victimisation	Past 12 months	At least one behaviour reported as "yes".	Victimisation: Physical – (1) hit, beaten or attacked with or without and object; (2) physical assault with an object; Property – (3) used force to take something away; (4) broke or ruined your things on purpose; Psychological – (5) name calling, saying mean things; (6) exclusion.
Finkelhor et al. (2015)	Sibling violence victimisation	Past 12 months	At least one behaviour reported as "yes".	Victimisation: (1) Physical: hitting; (2) Emotional: picking on, chasing, grabbing or forcing child to do things; (3) Sexual: making child do sexual things.

Table 1.1

Overview of Sibling Bullying Measures Used in Previous Studies

Study	Terminology	Timeframe	Frequency	Measure
Tippett & Wolke (2015)	Sibling aggression	Past 6 months	Sum-score indicated frequency.	Victimisation: (1) hitting, kicking or pushing; (2) taking belongings; (3) calling child nasty names; (4) making fun of child? Same for perpetration.
Tanrikulu & Campbell (2015)	Sibling bullying perpetration	Past 12 months	5-point Likert scale: Never; Only ever once or twice; 2 or 3 times a month; About once a week; Several times a week. Cut-off: At least once a week for sibling bullying groups.	Victimisation: Have you ever been bullied by your sibling? How frequently have you been bullied? Perpetration: Have you ever bullied a sibling? How frequently have you bullied a sibling?
Bar-Zomer & Klomek (2018)	Sibling bullying victimisation and perpetration	Past 6 months	4-point Likert-scale: Not at all; Less than once a week; More than once a week; Most days. Cut-off: >Once a week for sibling bullying groups.	Victimisation and perpetration: (1) hitting, slapping or pushing; (2) taking or stealing money; (3) threatening to hit or harm child.

Table 1.1

Overview of Sibling Bullying Measures Used in Previous Studies

Study	Terminology	Timeframe	Frequency	Measure
Morrill et al. 2018	Sibling abuse	N/A	6-point Likert-scale: Never; Very rarely; Rarely; Occasionally; Very frequently; Always	Victimisation and perpetration: 56 items about psychological (e.g. threatening to cause harm) and physical abuse (e.g. punching, hitting, kicking or shoving)
Toseeb et al. (2018)	Sibling bullying status	N/A	6-point Likert-scale: Never; Less often; Every few months; Around once a month; Around once a week; Most days. Cut-off: At least once a week.	Victimisation: How often do your brothers or sisters hurt you or pick on you on purpose? Perpetration: How often do you hurt or pick on your brothers and sisters on purpose?

1.2.1 Definition

For the purpose of this thesis, we will focus on the construct of sibling bullying. An adapted definition of peer bullying, taken from the Centre for Disease Control and Prevention (Wolke, Tippett, & Dantchev, 2015a) will be used in order to define sibling bullying:

Box 1.1

Definition of Sibling Bullying

Any unwanted aggressive behaviour(s) by a sibling that involves an observed or perceived power imbalance and is repeated multiple times or is highly likely to be repeated; bullying may inflict harm or distress on the targeted sibling including physical, psychological, or social harm. It encompasses two modes of bullying (direct and indirect) as well as four types of bullying (physical, verbal, relational, and damage to property).

1.2.2 Sibling Bullying Roles

As suggested by the peer bullying literature, children may be classified into distinct bullying groups based on their role taken in their involvement with bullying (Wolke, Woods, Bloomfield, & Karstadt, 2001). Stemming from the peer bullying literature, children may assume one of four sibling bullying roles: (1) non-involved; (2) victim; (3) bully; (4) bully-victim (Wolke & Skew, 2011). Non-involved children are neither victimised nor do they perpetrate sibling bullying. Sibling victims report being victimised by their siblings. Sibling bullies report perpetrating aggression against their siblings. Sibling bully-victims report *both* sibling victimisation and perpetration.

In peer bullying, children assuming the role of the bully-victim have been identified as a particular high-risk group for adverse mental health and wellbeing outcomes and are described as being the most troubled (Wolke, Copeland, Angold, & Costello, 2013). Peer bully-victims have for instance been reported to show the poorest

psychosocial and behavioural functioning (Haynie, Nansel, Eitel, Crump, Saylor, & Simons-Morton, 2001; Nansel, Overpeck, Pilla, Ruan, Simons-Morton, & Scheidt, 2001; Veenstra, Lindenberg, Oldehinkel, de Winter, Verlhulst, & Ormel, 2005; Wolke et al., 2013) compared to peer bullies, victims or uninvolved children. Peer bully-victims have further been found to have the highest risk for psychosomatic health problems in childhood (Wolke et al., 2001) as well as psychiatric and mental health problems in adolescence (Lereya, Copeland, Zammit, & Wolke, 2015) and adulthood (Copeland, Wolke, Angold, & Costello, 2013; Wolke et al., 2013). In the sibling literature, only two studies have previously examined the adverse outcomes of sibling bullying and differentiated between bullying groups. Similar to findings for peer bullying, sibling bully-victims have been found to have the highest levels of social-emotional difficulties (Wolke & Samara, 2004) as well as internalizing and externalizing problems (Toseeb et al., 2018) compared to other sibling bullying groups. However, these studies have both been cross-sectional. Replication of these findings as well as research employing longitudinal designs is needed.

1.2.3 Prevalence

The lack of an accepted definition specifying the severity, frequency and persistency of sibling bullying has largely contributed towards wide ranging prevalence estimates. Prevalence estimates for sibling bullying victimisation across childhood and adolescence range from roughly 15% to 50%, while prevalence estimates for sibling bullying perpetration range from 10% to 40% (Wolke et al., 2015). The majority of children involved in sibling bullying further appear to fall into the group of bully-victims, followed by victims and finally bullies who make up the smallest sibling bullying group (Bar-Zomer & Klomek, 2018; Tucker & Wolke, 2015; Toseeb et al., 2018; Wolke & Skew, 2011); unlike peer bullying where children are most likely to fall into the victim group (Bar-Zomer & Klomek, 2018; Wolke & Skew, 2012; Wolke et al., 2015). Studies further indicate that direct forms of sibling bullying such as physical aggression decline with age (Wolke & Skew, 2012) and are replaced with more sophisticated indirect forms of bullying including relational aggression (Tippett & Wolke, 2015; Tucker, Finkelhor, Turner, & Shattuck, 2014a). A summary of studies reporting on the prevalence of sibling bullying can be found in Table 1.2. Studies were selected on the basis of the sibling bullying definition provided in Box 1.1.

Table 1.2

Summary of Studies Reporting on the Prevalence of Sibling Bullying

Study	Country	Sample	Age (Years)	Sibling Bullying Instrument	Prevalence
Duncan (1999)	United States	375 children; 51.7% male	Mean 13.35	Adapted Peer Relations Questionnaire (PRQ; Rigby & Slee, 1992)	29.9% reported frequent sibling bullying victimisation. 41.5% reported sibling bullying perpetration.
Wolke & Samara (2004)	Israel	912 children; 49.1% male	Range 12–15 Mean 13.70	Adapted Olweus Bullying Questionnaire (Olweus, 1991)	16.5% victimised t least once a week. 3.3% only physical; 6.6% only verbal; 5.4% physical and verbal victims.
Finkelhor et al. (2006)	United States	2,030 children; 50% male	Range 2–17	Juvenile Victimisation Questionnaire (Hamby et al., 2004)	35% sibling victimisation (most common for 6-9 year olds); 20% peer victimisation

Table 1.2 continued

Summary of Studies Reporting on the Prevalence of Sibling Bullying

Study	Country	Sample	Age (Years)	Sibling Bullying Instrument	Prevalence
Button & Gealt (2010)	United States	8,122; 46% male	Range 13–18	5-item reflecting sibling aggression	42% were victimised by sibling. 31.3% verbal abuse; 12.4% threats; 32.4% shoving, pushing, slapping; 17.9% fighting; 2.9% fights or threats with weapons.
Wolke & Skew (2011)	United Kingdom	2,163 adolescents	Range 10–15	Adapted Olweus Bullying Questionnaire (Olweus, 1991)	54% of children were involved in sibling bullying. Bully/victims: 33.6%; Victims: 16%; Bullies: 4.5%.
Radford et al. (2013)	United Kingdom	2,160 parents; 2,275 youth 1,761 young adults	Range 2m–10 11–17 18–24	Juvenile Victimisation Questionnaire (Hamby et al., 2004)	28.4% of children reported sibling victimisation in the past year.

Table 1.2 continued

Summary of Studies Reporting on the Prevalence of Sibling Bullying

Study	Country	Sample	Age (Years)	Sibling Bullying Instrument	Prevalence
Skinner & Kowalski (2013)	United States	44 young adults; 55% male	≥ 18	Adapted Olweus Bullying Questionnaire (Olweus, 1991)	78% reported sibling bullying victimisation; 85% reports sibling bullying perpetration. Victims: 83% teasing; 69% physical; 66% excluding or ignoring. Bullies: 91% teasing; 72% physical; 61% excluded or ignored.
Bowes et al. (2014)	United Kingdom	6,928 children 46.7% boys	Range 11.9-15.1 Mean 12.1	Adapted Olweus Bullying Questionnaire (Wolke & Samara, 2004)	47.4% victimised. (17.2% only ever once or twice; 9.3% 2 or 3 times a week; 9.6% about once a week; 11.4% several times a week). Of those bullied several times a week: 12.7% hit, kicked, pushed or shoved; 2% possessions damaged/taken; 23.1% called names; 15.4% made fun of; 4.9% ignored/left out; 3.5% rumours spread; 2.5% bullied other way.

Table 1.2 continued

Summary of Studies Reporting on the Prevalence of Sibling Bullying

Study	Country	Sample	Age (Years)	Sibling Bullying Instrument	Prevalence
Tucker et al. (2014)	United States	1,705 children	Range 1m–17	JVQ	37.6% sibling victimisation. Type: 32.3% physical, 9.8% property, 2.7% psychological. Sub-groups: 45% for 2-5 year olds; 46% for 6-9 years olds; 35.7% 10-13 year olds; 27.6% 14.17 year olds.
Finkelhor et a;. (2015)	United States	4,000 children	Range 0 – 17	JVQ	21.8 % of children reported assault by juvenile sibling.
Tanrikulu & Campbell (2015)	United States	455 children 38.9% male	Grades 5–12	Sibling Bullying and Cyberbullying Questionnaire (S-TB&CBQ)	36.9% sibling bullying perpetration (traditional and cyber); 31.6% traditional only.. Age group: 43.4% primary students; 38% high school students reported perpetration.
Tippett & Wolke (2015)	United Kingdom	4,899 49.3% male	Range 10 -15 Mean 12.52	Sibling Bullying Questionnaire	45.8% were victims: 28.1% physical; 17.1% stealing; 26.5% verbal; 23.5% teasing. 35.6% were perpetrators: 20.4% physical; 9.9% stealing; 20.3% verbal; 19.6% teasing

Table 1.2 continued

Summary of Studies Reporting on the Prevalence of Sibling Bullying

Study	Country	Sample	Age (Years)	Sibling Bullying Instrument	Prevalence
Bar-Zomer & Klomek (2018)	Israel	319 children 36.1% males	Range 10–17	Adapted Peer Bullying Questionnaire (Klomek et al., 2013)	30.8% of children were involved in sibling bullying. 9.7% victims; 16.8% bully-victims; 4.3% bullies.
Toseeb et al. (2018)	United Kingdom	14,177 children	11	2 items reflecting sibling bullying victimisation and perpetration	48% of children were involved in sibling bullying. 16% victims; 27% bully-victims; 5% bullies.

1.3 Relevance of Researching This Topic

Taken together, most children report growing up with at least one sibling. Sibling relationships are one of the most enduring interpersonal relationships and sibling aggression has been reported as the most frequent form of interpersonal violence. Sibling conflict is furthermore considered a key parental concern (Perlman & Ross, 1997; Pickering & Sanders, 2017; Ralph, Tournbourou, Grigg, Mulcahy, Carr-Gregg, & Sander, 2003). Nevertheless, sibling bullying is still viewed as a normative feature that defines sibling relationships (Krienert & Walsh, 2011; Khan & Rogers, 2015). Retrospective data has for instance found that 58% of participants viewed sibling bullying as acceptable and 85% reported that this kind of behaviour should be expected (Skinner & Kowalski, 2013). Similar aggressive behaviour such as peer bullying has long been recognized as a serious problem behaviour. In contrast, despite prevalence estimates of sibling bullying perpetration and victimisation being higher than those of peer bullying (Duncan, 1999; Hoetger, Hazan, & Brank, 2015; Skinner & Kowalski, 2013; Tanrikulu & Campbell, 2015), it is not recognised in the same way. Sibling bullying is a largely unrecognized and a highly prevalent phenomenon which warrants more attention from researchers.

1.4 Conclusion

Chapter one provided an overview of the significance of the sibling relationship. The positive and the negative influences of siblings were summarized, the issue of a lacking consensus regarding the definition of sibling bullying was discussed and previous studies reporting on the prevalence and measurement of sibling bullying were reviewed. The upcoming chapter will cover the theoretical framework and empirical evidence in respect to the antecedents of sibling bullying.

CHAPTER TWO: Developmental Precursors of Sibling Aggression. Theoretical Perspectives and Empirical Evidence

Overview: *This chapter will first give a brief overview addressing some of the key theoretical perspectives that have been used to understand and explain the development of sibling aggression. It will then review the current empirical evidence related to the theories of sibling aggression. The focus of this chapter will be on sibling aggression, violence or bullying rather than the wider aspects of sibling relationships.*

2.1 Theoretical Perspectives

A number of theories have been put forward in order to explain the development of sibling aggression. The central theories are summarized below and their specific predictions are discussed.

2.1.1 Evolutionary Framework

Sibling Rivalry

Sibling rivalry has been described as a universal feature of family life, reflecting a child's jealousy over maternal affection (Levy, 1937). Levy coined the term "sibling rivalry" as a result of a series of experiments using a psychodynamic projective paradigm involving play with clay dolls. Using a sample of children ranging from 2-13 years, Levy (1941) presented children with a constellation of dolls depicting a baby at the mother's breast and an older child (brother or sister of the baby) facing the baby and the mother. Children were then prompted: "And then the brother sees the new baby at the mother's breast. He never saw him before. What does he do?". A majority of children reacted unanimously by attacking or destroying the baby doll and giving explanations such as "it was a bad baby" or "we don't need two babies in one house". Similar findings of this nature have been reproduced in both modern hunter-gatherer and industrialised societies in children and were maintained across patriarchal and matriarchal family organizations (Levy, 1939). These findings provide an illustration of sibling rivalry and show the interplay between jealousy and hostility that is experienced and portrayed by older children in response to the birth of a younger brother or sister. Levy concluded that sibling rivalry is a cross-cultural experience that

stems directly out of biological behaviour (Levy, 1939). It could be considered as a universal reaction in the fight for survival resources.

Frustration – Aggression Hypothesis

Work by Dollard, Doob, Mowrer, & Sears, (1939) further suggests that the emergence of aggression can best be understood as a consequence of frustration. In line with a psychodynamic approach, an individual that feels deprived or frustrated will feel the need to release that tension; typically, in the form of aggression (Miller, 1941). The birth of a new baby can easily become a frustrating situation to an older child (especially a first-born child) and may in turn provoke aggressive behaviour directed to that new-born baby (Levy, 1939; Felson, 1983). From an evolutionary perspective, siblings can be conceptualized as natural born competitors for parental resources including affection, attention or material goods. Within the family, first-born children can enjoy 100% of the resources that are provided by their parents. With the birth of a sibling, the availability of these resources will be halved; naturally allowing for the development of frustration in the first-born child. The second born child, on the other hand will only ever enjoy 50% of the same parental resources (and this will be reduced to 33% with the birth of a third child and so on).

Parent-offspring Conflict Theory

Along these lines, parent-offspring conflict theory (Trivers, 1974) argues that when parents and children disagree over the distribution of parental investment, conflict will emerge. Parental investment depends on the availability and quality of offspring as well as the prospect of conceiving future offspring (Trivers, 1974). Parents are equally genetically related to all of their offspring. With all factors being equal, parents should therefore value all offspring equally and invest in them equally (Salmon & Hehman, 2013). Each offspring however, will try to receive and demand disproportionally more parental investment compared to their siblings in order to secure higher chances of survival, successful reproduction and in turn transmission of one's own genes (Salmon & Hehman, 2013). This imbalance may then result in parent-child and child-child (sibling) conflict (Schlomer, del Guidice, & Ellis, 2011).

According to both the aggression-frustration hypothesis as well as the parent-offspring conflict theory, sibling aggression can be understood as an attempt by children

(particularly older children) to regain or hold onto their initial share (or more than their available share) of highly valued parental resources and parental investment (Salmon & Hehman, 2013; Schlomer et al., 2011 Trivers,1974).

Resource Control Theory

Resource control theory (RCT: Hawley, 1999) builds on the same evolutionary principles of resource limitation and competition (Darwin, 1859), however it additionally focuses on the construct of social dominance. Individuals vary in their abilities to compete for resources. RCT posits, that the intrinsic asymmetries (e.g. power, cognitive abilities) within individuals in social groups are the driving force of social dominance and resource-directed antagonistic behaviour (e.g. threats, insults, manipulation, aggression) that is utilized in order to secure access to resources in competitive contexts (Hawley, 1999). In a similar fashion, siblings are inherently characterized by a difference in power (e.g. size, age, strength). When desired resources are unavailable to a child or they are compromised by a sibling (e.g. parental attention or toys), children may resort to aggressive strategies in order to pursue their desired goal (Archer, 2013). Hence, sibling bullying may be a route that is endorsed by children in order to gain social dominance within the family and consequently secure more resources.

Predictions

1. Evolutionary driven theories of sibling aggression predict that sibling bullying will be driven by familial characteristics that compromise resource availability of highly valued resources (e.g. parental affection or material goods).
2. Particularly structural (e.g. number of children in the household) and family (e.g. financial difficulties) characteristics that may limit availability or heighten competition are expected to predict more sibling bullying (victimisation and perpetration).
3. Aggression-frustration and parent-offspring theory would specifically predict that especially first-born children will be more likely to perpetrate sibling bullying.

2.1.2 Attachment Theory

Attachment theory (Bowlby, 1969) is another theoretical perspective which aims to understand the emergence of sibling aggression. Infants are believed to form an attachment relationship to their primary caregivers within the first few years of life. According to attachment theory, high levels of sensitivity and responsiveness towards a child will result in a healthy and secure attachment. Inconsistent parenting (insecure-anxious) or dismissive/rejecting parenting (insecure-avoidant) will result in unhealthy and insecure attachment. Attachment bonds are important, as they form the basis for an internal working model of interpersonal relationships that has been found to shape an individual's expectations, understanding and behaviour within other social contexts and interpersonal exchanges (Whiteman, McHale, & Soli, 2011).

Infants who form secure attachments with their primary caregiver grow up with a positive self-concept and the ability to trust and care for others (Volling, 2001). Securely attached children should therefore be more likely to be supportive and caring in respect to their siblings (Teti & Ablard, 1989). Moreover, positive parenting practices (e.g. parental warmth or availability) have been proposed as a proxy for secure attachments bonds (Doinita & Maria, 2015) and would therefore equally be expected to foster positive sibling relationships (Kretschmer & Pike, 2009).

On the contrary, infants with insecure attachments are believed to have more difficulties forming positive social relationships and may have problems regulating their emotions (Booth, 1994; Shields & Cicchetti, 2001). Insecurely attached children may hence be more likely to behave avoidant or express hostility towards their siblings (Volling, 2001). There has indeed been evidence showing that insecurely attached sibling dyads engage in more antagonistic sibling relationships (Teti & Ablard, 1989) and report higher levels of sibling conflict and aggression (Volling & Belsky, 1992).

Predictions

1. Children who grow up in supportive and involved family environments will internalize positive internal working models of social relationships and learn to engage in caring interpersonal relationships. Secure and positive parenting may therefore reduce the risk of children's involvement in sibling bullying.

2. On the other hand, children growing up in unpredictable (e.g. parents with mental health problems) and rejecting homes (e.g. parental resentment or maltreatment) may have more problems trusting and connecting to significant others or regulating their emotions and could therefore be at increased risk for engaging in sibling aggression.

2.1.3 Family Systems Theory

Family systems theory argues that families are interdependent social systems in which individuals interact and mutually influence one another in a bidirectional fashion (parent–child; child–parent; parent–parent; child–child) (Minuchin, 1985; Cox, 2010). This theoretical perspective suggests that sibling relationships are best understood when examining the family system holistically (Hoffman & Edwards, 2004; Whiteman et al., 2011), rather than isolating and exploring single factors that may influence the developmental course of the sibling relationship. More specifically, family systems theory stresses the focus on family dynamics (e.g. negative parent-child relationships, family chaos or financial stress). While family systems theory is often employed to explain existing aggressive sibling relationships, it has not explicitly formulated factors that predict the development of sibling aggression within families. It rather alerts to a heuristic framework that multiple aspects of familial relationships should be considered when exploring the possible antecedents of sibling bullying.

Predictions

1. Family systems theory is a heuristic model and hence does not allow for specific predictions to be made about sibling aggression. However, this framework is useful as it can guide the selection process of possible precursor variables or antecedents of sibling bullying.
2. Family systems theory stresses the importance of examining the interaction/relationship of multiple family sub-systems including parent-parent (e.g. marital relationship), parent-child (e.g. parental hostility) and child-child (e.g. early sibling conflict) when exploring the developmental influences of sibling bullying (Caspi & Barrios, 2016).

2.1.4 Social Learning Theory

Social learning theory (SLT) posits that behaviour is learned through mechanisms of observation and reinforcement (Bandura, 1977). Individuals are accustomed towards anticipating possible rewards or punishments associated with behaviour (Bandura, 1969). When behaviour results in a favourable outcome, it is more likely to be modelled in future contexts; whereas behaviour that results in undesired outcomes will be avoided in other similar situations.

According to SLT aggressive behaviour can be learned either indirectly (via observation) or directly (via experience). Therefore, children who observe or experience aggression that is successful in obtaining rewards should be more likely to model and imitate this kind of behaviour in other similar social contexts. Indeed, witnessing domestic violence and experiencing physical or psychological abuse from parents has been linked to increased aggressive behaviour in children (Holmes, 2013). In the context of sibling aggression, we can imagine a child who grows up in a household where domestic violence takes place (e.g. a father beats up the mother for talking back at him). This child will learn that aggression can be a useful tool in order to dominate social situations and achieve compliance (Baldry, 2003). Along these lines, children exposed to this kind of family violence, may themselves resort to similar aggressive behaviour when faced with an argument with their sibling, in order to resolve the situation favourably for themselves. Similarly, children may also become the target of aggressive behaviour and directly experience violence within their family (e.g. physical punishment) or outside their home (e.g. peer bullying). These children will learn to perceive significant others as dangerous or malevolent and will become encouraged to view aggressive behaviour as an adaptive strategy within social interaction (Shields & Cicchetti, 2001).

Predictions

1. Children who witness or experience aggression and violence will learn to imitate these behavioural patterns in similar social situations in the future. Hence, children who have been victimised by their parents or their peers or have witnessed aggression and violence (e.g. domestic violence), may be more likely to imitate these negative interpersonal exchanges in the sibling context and be more likely to perpetrate sibling bullying.

2.1.5 Coercion Theory

Patterson's coercion theory stems from social learning perspectives and builds on the principles of reinforcement in order to explain the development of aggressive behaviour in children (Patterson, 1967). According to Patterson, ineffective (e.g. inconsistent or permissive) parenting is the root of coercive behaviour in families and children. Coercion can be understood as any aversive behaviour that results in an immediate consequence from the social environment (e.g. compliance with a demand or obtaining a reward) (Patterson, 1967; 1982). Families with poor family management skills may be unable to control coercive exchanges between family members. As a result, the family climate may become dominated by perpetuating coercive exchanges (parent – parent or parent – child) that run risk of spilling over onto the sibling context (Patterson, 1984).

Similar to social learning theory, coercion theory posits that children learn aggressive behaviour through observation and reinforcement. Unlike social learning theory however, coercion theory argues that observing/directly experiencing aggression is not sufficient in order acquire a coercive-aggressive interactional style (Patterson, 1967). Instead, other social agents including siblings are necessary.

Siblings spend an extensive amount of time with one another (Tucker, McHale, & Crouter, 2008), thereby serving as a main source of social input that provides a rich learning environment for interpersonal skills (Tucker & Updegraff, 2009). When sibling conflict is left unchecked by parents, children are given the chance to engage freely in coercive behaviour or hostile exchanges (Patterson, 1984). Siblings that endorse coercive behaviour (e.g. threatening or pushing) in order to reach a desired outcome (e.g. secure a desired toy), not only reinforce one another in these kinds of aversive socialization patterns, but also serve as reciprocal models for disruptive behaviour (Patterson, 1984). In fact, merely having a sibling increases the risk of aggression 4-fold (Trembley, 2004). These processes within the sibling relationship have led Patterson to describe the sibling context as a training ground for aggression (Patterson, 1982), where children learn and train one another in aggressive patterns of behaviour. Especially when parents ignore or permit early coercive exchanges between siblings, the potential for escalating aggression in the sibling relationship is high. When coercive cycles are continued, it allows for sibling conflict or hostility to

increase in frequency and intensity and consequently paves the path for persistent sibling aggression (Patterson, 1984).

Predictions

1. Parents creating a hostile family environment (e.g. shouting or fighting) will encourage their children to model and engage in similar behaviour with their siblings; increasing the likelihood of sibling bullying (perpetration).
2. When parents fail to intervene, or permit early sibling conflict and aggression; siblings will freely engage in coercive cycles teaching one another to use aggression that may escalate into and predict sibling bullying (perpetration and victimisation).

2.1.6 Individual Differences

Theories and research on individual differences are concerned with exploring the underlying psychological determinants (e.g. temperament, intelligence, attitudes, psychopathology etc.) that explain observable differences between individuals (Chamorro-Premuzic, 2016). Individual differences can act as vulnerabilities affecting an individual's appraisal and coping strategies in respect to social situations. For these reasons, exploring the influence of individual differences may be particularly important towards understanding the development of sibling aggression.

Social-Cognitive Abilities

Children with poor social-cognitive abilities including perspective taking, theory of mind or the ability to understand emotion (i.e. behavioural or social cues and facial expressions) have for instance been frequently associated with poor social competence skills and difficulties regulating emotional responses in social environments (Bengtsson & Arvidsson, 2011; Eisenberg, Fabes, Bernzweig, Karbon, Poulin, & Hanish, 1993; Trentacosta & Fine, 2010). There is also evidence suggesting that children who are high in aggression have difficulties with the interpretation and perception of social cues (Hall, 2006; Bowen & Dixon, 2010). Moreover, in the peer literature, low IQ in childhood has been reported as a risk factor for peer bullying (Farrington & Baldry, 2010). Examining children's social-cognitive abilities may

hence be a novel route towards better understanding the development of sibling bullying.

Behavioural Problems

Furthermore, some children may exhibit early signs of behavioural problems that could be indicative of a life-course persistent antisocial behaviour trajectory (Moffitt & Caspi, 2001), which is implicated with impairments in social functioning (Bongers, Koot, van der Ende, & Verhulst, 2008). Children who have difficult temperaments, display externalizing (e.g. conduct problems or hyperactivity) or peer problems have for instance been identified as more likely to engage in aggressive behaviour in childhood and adolescence (Kkkinos & Panayiotou, 2004; Moffitt & Caspi, 2001; Olson et al., 2011; Ribeaud & Eisner, 2010; Tremblay et al., 2004). Antisocial behaviour and externalizing problems in childhood have further been identified as strong predictors of peer bullying (Cook et al., 2010; Farrington & Baldry, 2010), allowing for similar predictions to be made about sibling bullying.

Self-Concept

Constructs relating to one's self-concept may also be important factors that can predict sibling aggression. In the peer bullying literature, children who hold negative self-related cognitions pertaining to attitudes and beliefs about themselves, have been found to become victimised more often by their peers compared to children with more positive self-related cognitions (Cook et al., 2010; Kokkinos & Panayiotou, 2004; Salmivalli et al., 1999). Furthermore, adolescents with low self-esteem and external locus of control have been found to display higher levels of aggression (Wallace, Barry, Zeigler-Hill, & Green, 2012). Similar associations may therefore be found for sibling bullying.

Psychopathology

Problems with regulating one's emotions and self-control have also been linked with aggression in childhood and adolescence (Ribeaud & Eisner, 2010; Olson, Lopez-Duran, Lunkenheimer, Chang, & Sameroff, 2011). Particularly those with some form of psychopathology are reported to have elevated problems in emotion-regulation, emotion-reactivity as well as self-regulation (Gross & Jazaieri, 2014). Scholars have argued that individuals diagnosed with a psychiatric disorder may be at increased risk

of engaging in emotionally charged acts of aggression and violence (Arseneault, Moffitt, Caspi, Taylor, & Silva, 2000; Cook, Williams, Guerra, Kim, & Sadek, 2010). Internalizing problems have additionally been identified as a probable predictor of peer bullying (Cook et al., 2010).

Sex

Finally, gender differences in particular are identified as strong and consistent predictors of aggression, with males typically engaging in more aggression (Archer, 2004; Card, Stucky, Sawalani, & Little, 2008).

Predictions

1. A child that is unable to interpret social cues (e.g. facial emotion recognition) effectively may be more likely to provoke conflicting interactions with their brothers or sisters (more sibling bullying victimisation and perpetration).
2. Children with difficult temperament, more regulatory problems (i.e. crying, feeding, sleeping), higher levels of externalizing problems and antisocial behaviour experiences will more likely be involved in sibling bullying (victimisation and perpetration).
3. Negative self-related cognitions (e.g. self-esteem or locus of control) may predict sibling bullying (victimisation and perpetration).
4. Children with psychopathology (e.g. psychiatric diagnosis, internalizing problems, IQ) will more often be involved in sibling bullying (victimisation and perpetration).
5. Males will more often bully their siblings compared to females. 2.1.7

Summary

Table 2.1 provides a summary and overview of all theories introduced and discussed above.

Table 2.1

Summary of Key Theoretical Perspectives Explaining the Development of Sibling Aggression

Theoretical Perspective	Theoretical Framework	Predictions about Sibling Bullying	Empirical Evidence
Evolutionary	Siblings are natural born competitors for limited parental resources. Asymmetries in social groups lead to social dominance and resource-directed agonistic behaviour used for resource acquisition.	Structural family characteristics and household composition predict sibling bullying (perpetration and victimisation).	Berkel et al., 2018; Bowes et al., 2014; Eriksen & Jensen, 2006, 2009; Hoffman et al., 2005; Menesini et al., 2010; Straus et al., 2006; Tucker et al., 2013; Tucker et al., 2014)
Attachment	Primary caregiver-child relationship fosters internal working model of interpersonal relationships (i.e. shapes individual's expectations, understanding, emotions and behaviours surrounding social interactions).	Supportive and warm parenting may protect against sibling bullying (victimisation and perpetration). Inconsistent and unpredictable parenting may predict sibling bullying (victimisation and perpetration).	Updegraff et al., 2005; Miller et al., 2012; Tippett & Wolke, 2015; Tucker et al., 204

Table 2.1

Summary of Key Theoretical Perspectives Explaining the Development of Sibling Aggression

Theoretical Perspective	Theoretical Framework	Predictions about Sibling Bullying	Empirical Evidence
Family System Theory	Families are interdependent social systems in which individuals interact and mutually influence one another in a bidirectional fashion (parent–child; child–parent; parent–parent; child–child).	This is a heuristic model; no specific predictions can be made. Stresses the importance of including multiple family sub-systems (e.g. parent-parent; child-parent; child-sibling) when exploring the precursors of sibling bullying.	–
Social Learning	Behaviour is learned through mechanisms of observation and reinforcement. Behaviour resulting in desired outcomes will be modelled in future contexts, whereas behaviour resulting in undesired outcomes will be avoided.	Witnessing domestic violence or experiencing abuse by parents/peers may predict sibling bullying (perpetration).	Berkel et al., 2018; Bowes et al., 2014; Button & Gealt, 2010; Eriksen & Jensen, 2006, 2009; Hoffman et al., 2005; Menesini et al., 2010; Radford et al., 2013; Straus et al., 2006; Tippett & Wolke, 2015; Tucker et al., 2013; Tucker et al., 2014; Updegraff et al., 2005)

Table 2.1

Summary of Key Theoretical Perspectives Explaining the Development of Sibling Aggression

Theoretical Perspective	Theoretical Framework	Predictions about Sibling Bullying	Empirical Evidence
Coercion	Parental failure to effectively discipline/control coercive family exchanges (i.e. aversive behaviours) permits sibling conflict. When left unchecked, sibling conflict will increase in frequency/amplitude allowing for escalating aggression between siblings. This may place a child at risk for other poor social relationships.	Ineffective parenting (e.g. inconsistent or shouting/hitting) that permits negative child behaviour (e.g. early sibling aggression) may predict sibling bullying (victimisation and perpetration).	Berkel et al., 2018; Bowes et al., 2014; Button & Gealt, 2010; Eriksen & Jensen, 2006, 2009; Hoffman et al., 2005; Menesini et al., 2010; Radford et al., 2013; Straus et al., 2006; Tippett & Wolke, 2015; Tucker et al., 2013; Tucker et al., 2014; Updegraff et al., 2005)
Individual Differences	Child individual differences place children on different developmental trajectories.	Child individual differences (e.g. internalizing/externalizing problems) may differentially predict sibling bullying (victimisation or perpetration).	Brody et al., 1994; Bowes et al., 2014; Menesini et al., 2010; Philipps et al., 2016; Rose et al., 2016; Tippett & Wolke, 2015; Toseeb et al., 2018; Song et al., 2016

2.2 Empirical Evidence

The central theoretical perspectives that have been employed in order to describe the emergence of sibling aggression have been outlined above and specific predictions in accordance to each framework have been made. Next, the focus will be on reviewing the current empirical evidence that has investigated some of the possible antecedents of sibling aggression or bullying. The next section will be organized and divided into four sub-sections or sets of potential precursor variables: 1) structural family characteristics 2) parent and parenting characteristics 3) early social experiences 4) individual differences; in order to allow for a systematic overview.

2.2.1 Structural Family Characteristics

Age Spacing

Sibling dyads who are closer in age have been identified as an at-risk group for negative sibling interactions (Aguilar, O'Brien, August, Auon, & Hektner, 2001; Buhrmester & Furman, 1990; Felson & Russo, 1988; Minnett, Vandell, & Santrock, 1983; Tanskanen et al., 2017) and victimisation by siblings (Tucker, Finkelhor, Shattuck & Turner, 2013a). One reason for this may be that siblings who have less of an age difference might engage in more conflict because the power structure between the children is less clear (Hoffman & Edwards, 2004). However, there has been evidence of the contrary, with studies reporting no effects of age difference on sibling relationship quality (Recchia & Howe, 2009) or sibling violence (Hoffman, Kiecolt, & Edwards, 2005).

Birth Order

Findings on birth order effects (first born vs. later born) have been mixed in the sibling aggression literature. Some studies have found that later-born children report poorer sibling relationships (Recchia & Howe, 2009) and more sibling aggression (Hoffman et al., 2005; Martin & Ross). Similar findings have been reported using longitudinal data, with more frequent sibling bullying victimisation reported by children with an older sibling (Bowes et al., 2014). Similarly, Bowes et al., 2014 found that first-born children were more often the perpetrators of sibling bullying. However, there is also contradictory evidence suggesting that being the older or first-born child was

associated with more sibling victimisation (van Berkel et al., 2018; Tippett & Wolke, 2015; Tucker et al., 2014a) and others who report no birth order effects (Updegraff, Thayer, Whitemn, Denning, & McHale, 2005).

Dyadic Constellation

Effects for gender composition have equally been mixed. While some studies report more sibling aggression in same-sex sibling pairs (Minnett et al., 1983; Tucker et al., 2013a), others have found that mixed-sex pairs report higher levels of sibling aggression; with older brother-younger sister pairs at the highest risk (Aguilar et al., 2001; Hoffman & Edwards, 2004). The mode of aggression may be one possible explanation for the mixed evidence of gender effects. Male siblings (particularly older males) have for instance been reported to be more physically aggressive, whereas female siblings (particularly older females) were found to be more relationally aggressive (Ostrov, Crick, & Stauffacher, 2006).

Number of Children

Households with more children have been associated with more sibling rivalry (Stocker, Lanthier, & Furman,1997). Similar findings are also reported for sibling aggression. Larger households with more children have been linked to more sibling bullying victimisation (van Berkel et al., 2018; Bowes et al., 2014; Tippett & Wolke, 2015; Toseeb et al., 2018) and perpetration (Tippett & Wolke, 2015; Toseeb et al., 2018). While the majority of findings do find larger households with more children predictive of sibling bullying; there have also been some contradictory findings showing no effect for the number of children and a link to sibling violence (Hardy, 2001; Relva, Fernandos, & Mota, 2013).

Socioeconomic Status

Evidence for socioeconomic status (SES), a proxy of resources in the family, is mixed. In respect to sibling victimisation, some studies show an association with high socioeconomic status (van Berkel et al., 2018), others report more poverty or financial stress (Tippett & Wolke, 2015), yet others show no relationship (Toseeb et al., 2018). In respect to sibling perpetration, some studies have found lower levels of socioeconomic status to be associated with less sibling bullying perpetration (Toeseeb et al., 2018), while others have reported higher levels of sibling violence perpetration

(Eriksen & Jensen, 2009). Interestingly, children raised in families where mothers have achieved higher educational qualification are reported to have higher levels of physical violence directed at siblings (Eriksen & Jensen, 2009; Tippett & Wolke, 2015) and are also more likely to become victimised (Tucker et al., 2013a; Tucker, Finkelhor, Turner, & Shattuck, 2014b), perhaps because there is more competition for material goods. Other studies report that lower social class is associated with sibling bullying victimisation (Bowes et al., 2014).

Marital Status

Most studies on marital status report that children growing up in single-parent households are no more likely to be involved in sibling bullying victimisation (van Berkel et al., 2018; Hardy, 2001; Tucker et al., 2013a) or perpetration (Toseeb et al., 2018) compared to those growing up in two-parent households. There is also some evidence suggesting the contrary. Children growing up in single-parent families have for example been found to report the highest levels of sibling negativity (Deater-Deckard & Dunn, 2002) and engage in more sibling violence when growing up in step-families (Hofmann et al., 2005).

Summary and Limitations

Table 2.2. provides an overview and summary of the empirical evidence that links structural and family characteristics to sibling aggression. While there is mixed evidence across all selected factors, the literature would largely suggest that sibling bullying occurs more frequently in families with more children. Particularly first-born children or older males are found to act as perpetrators compared to later-born and younger children who tend to become victimised more often. The above-mentioned studies support an evolutionary framework proposing that factors associated with the limitation of resources and heightened competition (e.g. larger households with older or first-born children) should be predictive of sibling aggression.

There are also a few limitations with the current studies on structural family characteristics.

1. Most studies are cross-sectional; with only two prospective studies (Bowes et al., 2014; Toseeb et al., 2018). More longitudinal studies are needed.

2. All current studies have only explored the crude association between individual structural family characteristics and sibling aggression/bullying; without controlling for each other or other potential precursors (e.g. child characteristics). Systematic, well-controlled studies are needed.
3. There is still mixed evidence across most structural family characteristics identified above. More work replicating current findings is needed.

Table 2.2

Summary of Empirical Evidence for Association between Structural and Family Characteristics and Sibling Aggression

Construct	Direction	Strength of Association	Empirical Evidence
Age spacing	Smaller age gap ↑ Sibling aggression	Consistent; some mixed	Aguilar et al., 2001; Hoffman, 2005; Felson & Russo, 1988; Minnett et al., 1983; Recchia & Howe, 2009; Tanskanen et al., 2015; Tucker et al., 2013
Birth order (first vs later)	First-Born ↑ Perpetration; Later-Born ↑ Victimization	Mixed	Bowes et al., 2014; Berkel et al., 2018; Menesini et al., 2010; Recchia & Howe, 2009; Tippett & Wolke, 2015; Wolke & Skew, 2011
Dyadic constellation (older vs younger)	Older children ↑ Perpetration; Younger children ↑ Victimization	Consistent; some mixed	Aguilar et al., 2001; Hoffman & Edwards, 2004; Ostrov et al., 2006; Minnett et al., 1983; Tucker et al., 2013
Number of children	More children ↑ Sibling aggression	Fairly Consistent	Berkel et al., 2018; Bowes et al., 2014; Hardy, 2001; Tippett & Wolke, 2015; Toseeb et al., 2018
Socioeconomic status	Mixed	Mixed	Berkel et al., Bowes et al., 2018; Eriksen & Jensen, 2009; 2018; Tippett & Wolke, 2015; Toseeb et al., 2018
Marital status	No association	Consistent	Berkel et al., 2018; Hardy, 2001; Hofmann et al., 2005; Toseeb et al., 2018

2.2.2 Parent and Parenting Characteristics

Positive Parent-Child Relationships

There are three previous studies that have explored positive parenting practices as a correlate of sibling aggression; all of which have employed a cross-sectional design. Updegraff et al. (2005) found that greater parental warmth and parental involvement was associated with lower levels of relational aggression between siblings. Similarly, children who reported no experience of sibling victimisation were found to grow up in families with higher levels of parental warmth compared to those children who were victimised by their brothers and sisters (Tucker et al., 2014b); with those severely victimised being the least likely to grow up in homes with warm parent-child relationships. Finally, Tippett & Wolke (2015) further support these findings, showing that positive parenting behaviour (e.g. praising or hugging child) can act protective of sibling aggression; reducing the likelihood of both sibling victimisation and perpetration.

Negative Parent-Child Relationships

Negative parent-child relationships are perhaps the most frequently studied and best-established correlate of sibling aggression. It has even been suggested as the strongest predictor of sibling aggression, even in the context of demographic, structural and other characteristics (Eriksen & Jensen, 2009; Tippett & Wolke, 2015). In respect to perpetrating sibling aggression, severe forms of negative parenting practices such as parent-to-child violence, have been put forward as a key correlate of sibling violence perpetration (Eriksen & Jensen, 2009; Relva, 2013; Yu & Gamble, 2008a, 2008b). Harsh parenting that includes corporal punishment or shouting at a child has further been identified as a correlate of perpetrating sibling aggression (Eriksen & Jensen, 2009; Tippett & Wolke, 2015; Toseeb et al., 2018). Regarding sibling victimisation, inconsistent (e.g. poor supervision) or harsh parenting (e.g. shouting, smacking) has similarly been reported more frequently in children who are victimised by their siblings (Tippett & Wolke, 2015; Tucker et al., 2014b; Toseeb et al., 2018). Furthermore, maltreatment by a parent or caretaker has also been associated with experiencing sibling victimisation and abuse (Radford et al., 2013; Button & Gealt, 2010), even in a prospective study (Bowes et al., 2014). There is only one previous

study that has looked at factors associated with sibling bullying groups (Toseeb et al., 2018), these scholars found that harsh parenting was predictive of any sibling bullying involvement (victim, bully-victim and bully).

Parent-Parent Relationship

The emotional climate of the interparental relationship has also been frequently and consistently associated with sibling aggression. Better quality marital relationships have for instance been associated with warmer parenting styles and more positive sibling relationships (Yu & Gamble, 2008a, 2008b). In contrast, heightened interparental conflict has been associated with increased levels of sibling victimisation (Tucker et al., 2014). Moreover, children who are raised in families where they witness domestic violence, have been reported to be at risk for perpetrating sibling aggression (Eriksen & Jensen, 2006; Piotrowski & Cameransesi, 2014; 2018), but also sibling victimisation (Button & Gealt, 2010; Bowes et al., 2014; Noland et al., 2004).

Parental Mental Health

There is consistent evidence suggesting that parental mental health may impair parenting abilities including lower maternal warmth, higher levels of emotional/physical unavailability, more frequent child physical/psychological abuse as well as producing more insecure mother-child attachment bonds (Coyl, Roggman, & Newland, 2002; Holmes, 2013; Leinonen, Solantaus, & Punamäki, 2003; Smith, 2004). Moreover, poor maternal mental health has been predictive of more child aggressive behaviour more generally (Holmes, 2013). There is some evidence suggesting that maternal mental health is directly linked to more aggressive behaviour among siblings (Miller, Grabell, Thomas, Bermann, & Graham-Bermann, 2012) and increases the odds of becoming victimised by a brother or sister (Bowes et al., 2014), however findings are limited to maternal depression only. The peer bullying literature on the other hand has found that suboptimal maternal mental health was associated with higher odds of bullying perpetration (Shetgiri, Lin, Avila, & Flores, 2012).

Summary and Limitations

Table 2.3. summarises the empirical evidence that links parent and parenting characteristics to sibling aggression. Warm, sensitive and supportive parenting appear to be protective of sibling aggression, as proposed by attachment theory. Furthermore,

as suggested by family-systems theory it appears necessary to explore both the parent-parent (however only in respect to domestic violence and not to marital relationship) as well as the parent-child relationship in order to gain a better understanding of what aspects of the family dynamic are important towards explaining sibling aggression. Witnessing or experiencing violence within the home, appear to be a risk factor for sibling aggression, as put forward by social learning theory.

Limitations:

1. The majority of studies are cross-sectional; with the exception of two prospective studies (Bowes et al., 2014; Toseeb et al., 2018).
2. Bowes et al. (2014) explore a range of parenting characteristics, however the study is limited to sibling bullying victimisation only.
3. Toseeb et al. (2018) explore sibling bullying victimisation, perpetration and group involvement separately, however the study is limited to only one aspect of parenting (i.e. harsh parenting). Studies differentiating between sibling bullying groups are needed.
4. Toseeb et al. (2018) reported only on the crude associations and did not control for other potential precursors at the same time (e.g. structural family characteristics).
5. There is a limited number of studies exploring the relationship between sibling aggression and positive parent-child relationships and parental mental health.
6. Studies on parental mental health are limited to maternal depression only.

Table 2.3

Summary of Empirical Evidence for Association between Parent and Parenting Characteristics and Sibling Aggression

Construct	Direction	Strength of Association	Empirical Evidence
Positive parent-child relationship	Parental warmth ↓ Sibling aggression	Consistent; strong association	Updegraff et al., 2005; Tucker et al., 2014; Tippett & Wolke, 2015
Negative parent-child relationship	Harsh parenting ↑ Sibling aggression; Maltreatment ↑ Sibling aggression	Consistent; strong association	Bowes et al., 2014; Button & Gealt, 2010; Eriksen & Jensen, 2009; Radford et al., 2013; Relva, 2013; Tippett & Wolke, 2015; Yu & Gamble, 2008
Parent-Parent relationship	Interparental conflict ↑ Sibling aggression; Domestic violence ↑ Sibling aggression	Consistent; strong association	Bowes et al., 2014; Button & Gealt, 2010; Eriksen & Jensen, 2006; Noland et al., 2004; Piotrowski et al., 2017; Yu & Gamble, 2008
Parent mental health problems	Parental mental health problems ↑ Sibling aggression	Consistent; weak association; limited to maternal depression.	Bowes et al., 2014; Holmes, 2013; Millet et al., 2012

2.2.3 Early Social Experiences

Sibling Relationship Quality

Sibling relationships that benefit from a balance between nurturance and conflict promote children's healthy development, while those dominated by conflict may pave the path for persistent and escalating aggression between brothers and sisters (see chapter one). Indeed, high levels of sibling negativity as well as low levels of sibling intimacy have previously been associated with increased relational aggression between siblings (Updegraff et al., 2005). Similarly, high levels of sibling conflict and low levels of sibling empathy have been reported more often by children involved in sibling bullying (victimisation and perpetration; Menesini, Camodeca, & Nocentini, 2010) and severe sibling violence (Khan & Cooke, 2008).

Time Spent with Siblings in Shared Activities

By middle childhood, children have been reported to spend more time with their brothers and sisters than in any other social context (McHale & Crouter, 1996). While siblings may actively choose to interact with their siblings, there is a strong element of obligation to spend time with one another as a result of the confined space of the home environment (Punch, 2008). Scholars have therefore argued, that extensive temporal involvement and familiarity may breed contempt between siblings and create more opportunities for sibling conflict and aggression (Felson & Russo, 1988; Tucker et al., 2008; Tucker & Finkelhor, 2015; Punch, 2008). While there is some evidence showing that siblings who spend more time in unstructured activities are more likely to report poor well-being (i.e. greater depression and lower self-esteem) and lower peer competence (Tucker et al., 2008), there is also work that has found no association between time spent in shared activities and relational aggression between siblings (Updegraff et al., 2005).

Peer Bullying

The relationship between sibling bullying and peer bullying has been well-documented in cross-sectional studies which have reported a strong and consistent association between bullying across the sibling and peer context (Duncan, 1999; Mesnisini, 2010; Tanrikulu & Campbell, 2015; Tippett & Wolke, 2015; Wolke &

Samara, 2004). While there are no longitudinal studies exploring the relationship between sibling bullying and peer bullying, scholars have found that antisocial behaviour directed towards a brother or sister in early childhood is prospectively associated with peer aggression three years later (Ensor, Marks, Jacobs, & Hughes, 2010).

Summary and Limitations

Table 2.4**.** provides an overview and summary of the empirical evidence that links early social experiences to sibling aggression. The evidence outlined above demonstrates that experiencing negative sibling and peer relations early on, may influence the development of sibling aggression. In line with coercion theory, sibling relationships that are marked by high levels of negativity and conflict are found to act as a training ground for escalating sibling aggression. Similarly, the evidence supporting the link between sibling and peer bullying shows that involvement in peer bullying may serve as an early model for socialization, encouraging children to reproduce this kind of aggressive behaviour in the sibling context, as suggested by social learning theory.

Limitations:

1. There is a limited number of studies looking at the link between sibling relationship characteristics (e.g. quality and temporal involvement) and sibling aggression.
2. No previous studies have explored the relationship between sibling relationship characteristics and involvement in the different sibling bullying roles (victim, bully-victim, bully).
3. There is no consistent evidence supporting the relationship between sibling time spent together and sibling bullying.
4. All previous studies on the relationship between sibling and peer bullying are cross-sectional; direction of association is therefore unclear.
5. Studies on early social experiences (sibling and peer influences) have not accounted for other confounding variables (e.g. parenting characteristics).

Table 2.4

Summary of Empirical Evidence for Association between Early Social Experiences and Sibling Aggression

Construct	Direction	Strength of Association	Empirical Evidence
Sibling Relationship Quality	Poor sibling relationship ↑ Sibling bullying; Positive sibling relationship ↓ Sibling bullying	Consistent, limited number of studies	Khan & Cooke, 2008; Menesini et al., 2010; Updegraff e al., 2005
Time Spent with Siblings	More time spent with sibling ↑ Sibling bullying	Inconsistent	Tucker & Crouter, 2008; Updegraff et al., 2005
Peer Bullying	Peer bullying ↑ Sibling bullying	Consistent, strong association	Duncan, 1999; Ensor et al., 2010; Menesini et al., 2010; Tanrikulu & Campbell; Tippett & Wolke, 2015; Wolke & Samara, 2004

2.2.4 Individual Differences

Sex

Typically, males have been reported to perpetrate more sibling aggression and sibling bullying compared to females (Aguilar et al., 2001; Eriksen & Jensen, 2009; Hoffman et al., 2005; Krienert & Walsh, 2011; Mensini et al., 2010; Noland et al., 2004; Relva et al., 2013; Tippett & Wolke, 2015; Wolke & Skew, 2011). Female children on the other hand, have been identified as more likely to become victimised at the hands of their siblings (Aguilar et al., 2001; Bowes et al., 2014; Button & Gealt, 2010; Krienert & Walsh 2011; Toseeb et al., 2018; Wolke & Skew, 2011). A few other studies have failed to find any gender differences for sibling bullying perpetration (Toseeb et al., 2018) and victimisation (Relva et al., 2013; Tucker et al., 2013; Updegraff et al., 2005), while others have even reported more sibling bullying perpetration by females (Tanrikulu & Campbell, 2015). Furthermore, specific gender effects have also been reported with older male children in particular posing a risk for sibling aggression (Bowes et al., 2014; Menesini et al., 2010; Recchia & Howe, 2009; Wolke & Skew, 2011).

Temperament

Temperamental characteristics may predispose children to engage in aggressive behaviour (Marini, Dane, & Kennedy, 2010). Dysregulated child temperament (e.g. high levels of anger; low levels of soothability) have been associated with lower relationship quality and greater agonistic behaviour amongst siblings (Brody, 1994; Oh, Volling, & Gonzalez, 2015; Yu & Gamble, 2008b). Furthermore, higher levels of energy or extraversion (active, dynamic, dominant behaviour) in children have also been found to be associated with more sibling bullying perpetration (Menesini et al., 2010), while trait anger has been linked to sibling bully and sibling bully-victim status (Tanrikulu & Campbell, 2015).

Social-Cognitive Characteristics

Poorer theory of mind has been reported to predict sibling relationships dominated by high levels of conflict (Hughes & Ensor, 2006) as well as sibling antagonism (Song, Volling, Lane, & a`Wellman, 2016). An intervention study that taught families how

to improve their children's emotion regulation further showed that those who participated were found to show improved sibling involvement and warmth as well as reduced conflict and agonistic behaviour compared to controls (Kennedy & Kramer, 2008), further supporting the importance of social-cognitive skills in positive sibling relationships. Social competence or high cognitive abilities on the other hand, may also be related to sibling bullying involvement. Morally disengaged children have for instance been identified as more likely to bully their siblings (Tanrikulu & Campbell, 2015). Similarly, children with better cognitive function have also been reported to bully their siblings more often (Toseeb et al., 2018). Children with autism spectrum disorder on the other hand, have been identified as an at-risk group for sibling bullying victimisation (Toseeb et al., 2018).

Emotional and Behavioural Problems

Furthermore, children who show early signs of aggressive tendencies have been identified as a risk group for engaging in more frequent aggressive exchanges with their siblings. Children with higher baseline measures of aggression have been found to be more likely to have sibling relationships that are characterized by more frequent, intense and prolonged aggressive behaviours (Aguilar et al., 2001). Similarly, firstborn children with higher levels of aggression prior to the birth of their sibling have been found to predict more sibling antagonism up to 12 months after the birth of the second child (Song et al., 2016). Furthermore, there is also some evidence suggesting that children who are victimised by their siblings have more elevated levels of internalizing problems in early childhood (Bowes et al., 2014)

Summary and Limitations

Table 2.5. provides an overview and summary of the empirical evidence that links child individual differences to sibling bullying. In general, being male, having a difficult temperament, poor social-cognitive abilities as well as behavioural and emotional problems early on, all appear to be an early warning sign and indicative of children's involvement in sibling bullying.

Limitations:

1. The majority of studies are cross-sectional.
2. Only two prospective studies have explored the link between child individual differences and sibling bullying (Bowes et al., 2014; Toseeb et al., 2018).
    - They both only explore sex, internalizing and externalizing problems and do not control for other confounders at the same time.
3. There is only one study that has explored child individual differences in respect to specific sibling bullying roles (Tanrikulu & Campbell, 2015).
4. There are no studies that have integrated and included a large range of individual differences and explored these together, whilst controlling for each other.

Table 2.5

Summary of Empirical Evidence for Association between Individual Differences and Sibling Aggression

Construct	Direction	Strength of Association	Empirical Evidence
Sex	Male ↑ Perpetration; Females ↑ Victimisation	Consistent; some minor exceptions	Aguilar et al., 2001; Bowes et al., 2014; Button & Gealt, 2010; Eriksen & Jensen, 2009; Hoffman & Edwards, 2004; Hoffman et al., 2005; Krienert & Walsh, 2011; Minnett et al., 1983; Menesini et al., 2010; Noland et al., 2004; Relva et al., 2013; Tanrikulu & Campbell, 2015; Tippett & Wolke, 2015; Toseeb et al., 2018; Wolke & Skew, 2011; Updegraff et al., 2005
Temperament	Dysregulated temperament ↑ Sibling bullying perpetration	Consistent; limited number of studies	Brody, 1994; Menesini et al., 2010; Tanrikluku & Campbell, 2015; Oh et al., 2015; Yu & Gamble, 2008
Social-Cognitive Characteristics	↑ Social cognition ↑ perpetration; ↓ Social cognition ↑ victimization	Consistent; limited number of studies	Hughes & Ensor, 2005; Song et al., 2016; Tanrikulu & Campbell, 2015; Toseeb et al., 2018
Emotional and Behavioural Problems	Emotional problems ↑ Sibling bullying victimisation; Behavioural problems ↑ Sibling bullying perpetration	Consistent; limited number of studies	Aguilar et al., 2001; Bowes et al., 2014; Song et al., 2016

2.5 Conclusion and Future Directions

This chapter outlined some of the central theoretical perspectives that may guide the prediction of sibling aggression, violence or bullying. Of the empirical evidence for the alternative theories, the majority of studies have explored associations of sibling aggression with structural family and parenting characteristics. There is also fairly consistent evidence supporting the relationship between sibling aggression with sex and peer bullying. Areas which have been neglected as potential precursors to sibling bullying are early sibling relationship characteristics and child individual differences other than sex.

The greatest criticism of the existing literature is that the vast majority of studies have employed cross-sectional designs. This prevents directional or causal conclusions to be drawn. What is needed are large and representative longitudinal designs in order to capture temporal and prospective associations between the possible precursors of sibling bullying. Second, there are no studies that have systematically explored structural, parenting, early social experiences and individual differences as precursors to sibling bullying at the same time, whilst controlling for each other. This would allow to test alternative theoretical models of the development of sibling bullying. Third, there is a lack of studies that differentiate between sibling bullying roles (victim, bully-victim, bully). It is important to integrate sibling bullying roles in order to capture specific antecedents that may be linked to those children that are bullies, victims or do both (bully-victims). This is important to understand for tailoring intervention and prevention strategies to the specific roles involved in sibling bullying

The next chapter will explore the adverse outcomes of sibling bullying.

CHAPTER THREE: Adverse Outcomes of Sibling Bullying: Associations with Peer Bullying, High-Risk Behaviour and Psychotic Disorder. Empirical Evidence and Theoretical Perspectives.

Overview: *This chapter will examine some of the theoretical frameworks that have been employed to help explain how sibling bullying may result in adverse outcomes. The focus will be on the following three sets of outcomes: (1) peer bullying; (2) high-risk behaviour; (3) mental health problems. First, the focus will be on how sibling bullying may be associated with peer bullying and high-risk behaviour. The existing literature linking sibling bullying to peer bullying as well as high-risk behaviour will be reviewed and outstanding issues will be discussed. Next, this chapter will discuss how sibling bullying may be linked with the development of psychotic disorder. The existing literature relating to sibling bullying and mental health problems will be reviewed and outstanding issues will be discussed.*

3.1 Sibling Bullying and Adverse Outcomes

Below, a range of theoretical frameworks will be reviewed in order to help explain (1) how sibling bullying may generalize onto other social contexts and influence behavioural patterns in order to foster the development of peer bullying, antisocial behaviour, delinquency or substance use; (2) how trauma may modify children's perception of their self and the world, influence their expectations about future events or alter their physiological systems in order to help explain how sibling bullying may promote the development of psychotic disorder.

3.2 Theories Linking Sibling Bullying to Peer Bullying and High-Risk Behaviour

3.2.1 Social Learning Theory

As introduced in chapter two (section 2.1.4), social learning theory (SLT) builds on principles of observational learning and reinforcement (Bandura, 1977). Along those lines, SLT proposes that aggression is learned either through observation (e.g. domestic violence) or experience (e.g. physical abuse) of aggressive behaviour. Conflict and negativity between siblings may provide one specific context allowing

for observational learning and reinforcement of deviant behaviour to take place (Kim et al., 2007). Children who behave aggressively towards their siblings (e.g. hitting sibling) in order to reach a positive consequence (e.g. taking toy away from sibling) will learn that aggression can be instrumental towards achieving a desired outcome. Children lacking parental supervision or involvement may be at a particular risk of freely perpetrating aggression directed towards a sibling (Patterson, Debaryshe, & Ramsey,1990). In turn, children may internalize aggression as a useful tool and learn to utilize similar behaviours in other contexts (Button & Gealt, 2010; Patterson et al., 1990). SLT would therefore predict that sustained involvement in sibling bullying perpetration will teach children to continue resorting to similar aggressive patterns (i.e. peer bullying, antisocial behaviour or criminality later in life) in order to continue securing benefits including access to personal/material goals and achieving social dominance (Button & Gealt, 2010; Solmeyer et al., 2014; Wolke & Samara, 2004). Bullies and bully-victims should therefore be at the highest odds for involvement in high-risk behaviour.

3.2.2 Coercion Theory

Coercion theory may similarly allude towards the mechanisms involved in the transmission of aggression from the sibling context. Further details outlining coercion theory can be found in chapter two (see section 2.1.5).

Siblings are powerful social agents that may mutually influence one another's behaviour by becoming fellow travellers in coercive family processes (Patterson, 1984). The sibling context fosters reciprocal learning opportunities for aggression, allowing siblings to assume the interchangeable roles of both the perpetrator and the victim. Children that engage in persistent conflict with their brothers and sisters may become trapped in a negative coercive cycle which is difficult to end (Stocker et al., 2002) and which may easily escalate into persistent sibling aggression (Patterson, 1986). Siblings who engage in sibling aggression and internalize these aggressive models of socialization are at risk for generalizing these onto their peer relationships and can thereby pave the path for delinquency (Patterson, 1984, 1986). In Patterson's developmental model of antisocial behaviour (Patterson, 1990) the aetiology of antisocial behaviour is described as occurring in the context of a developmental

sequence of experiences. Ineffective parenting leads to coercive family interaction processes (including sibling hostility) setting the scene for problematic peer relations which cumulatively place the child at risk for chronic delinquent behaviour. Coercion theory would thereby predict, that involvement in both sibling bullying victimisation and perpetration will increase the likelihood of peer bullying involvement and will in turn be associated with more high-risk behaviour. In line with coercion theory, bully-victims should therefore be at the highest odds of engaging in high-risk behaviour (particularly if they are also involved in deviant peer relations).

3.2.3 General Strain Theory

General strain theory (GST) focuses on negative interpersonal relationships where individuals feel mistreated and are prevented from achieving their desired goals (Agnew, 1992). According to general strain theory, the experience of this kind of negative relationship induces feelings of anger and frustration, which encourage corrective behaviour including delinquency or substance use in order to reduce or alleviate the negative emotions caused through the strain (Agnew, 1992). Agnew (2001) argues that experiencing strain is most likely to result in delinquent or criminal behaviour if the following criteria are met: (1) strains are perceived as unjust; (2) strains occur in high magnitude; (3) strains are associated with low social control; (4) strains induce or incentivise coping or compensatory action; concluding that harsh parenting, child abuse and peer bullying victimisation may encompass the strongest strains predictive of delinquency (Agnew, 2001). According to GST, children who become victimised by their siblings would be expected to be involved in the highest levels of peer bullying and high-risk behaviour. Specifically, sibling victims and bully-victims would be expected to develop the highest degree of high-risk behaviour.

3.2.4 Underlying Antisocial or Violent Tendency

Finally, it is important to consider that individuals may have a predisposed antisocial behaviour tendency. In this way, sibling bullying involvement may act as a marker rather than a cause of developing high-risk behaviour. Childhood conduct problems have for instance been identified as a strong predictor of high-risk behaviour in adulthood; including antisocial behaviour, substance use and criminality (Babinski, Hartsough, & Lamberth., 1999; Fergusson, Horwood, & Ridder, 2005). Children who

display externalizing problems or other aggressive tendencies from childhood through adolescence have been described as being on a life-course persistent antisocial behaviour trajectory (Moffitt, 2015). Individuals on such a path have been reported to engage in age-appropriate aggressive behaviour that adjusts according to the current developmental period. Hence, aggressive behaviour in childhood may include hitting or kicking, while aggressive behaviour at a different developmental stage (e.g. late adolescence) may include more severe forms of violence or substance use (Piquero, Gonzalez, & Jennings, 2015). Children on a life-course-persistent antisocial trajectory have been reported to suffer the poorest long-term outcomes in the domains of health, wealth and wellbeing (Huesmann, Dubow, & Boxer, 2009; Moffitt, 2015) compared to individuals who display antisocial behaviour later in life or not at all. In order to prevent or reduce the development of more severe forms of aggression later in life, it is therefore essential to identify at-risk children early on and address these early forms of aggression (Ttofi, Farrington, & Lösel, 2012).

3.3 Empirical Evidence: Peer Bullying and High-Risk Behaviour

3.3.1 Sibling Bullying and Peer Bullying

There is now sufficient and consistent evidence pointing towards a robust association between sibling and peer bullying (see Table 3.1). Sibling and peer bullying are reported as being homotypically related (Tucker et al., 2014a; Tippett & Wolke, 2015) in respect to the role assumed in the bullying behaviour (e.g. perpetrating sibling bullying is associated with perpetrating peer bullying). According to the literature, it may further be concluded that there is a transmission of bullying behaviour across the home and school context (Wolke & Samara, 2004; Wolke & Skew, 2011; Tucker et al., 2014a; Tippett & Wolke, 2015; Bar-Zomer & Klomek, 2018), resonating with social learning and coercion theory which postulates that aggression experienced in one context may become transferred onto another one. However, as a result of the cross-sectional designs of the existing studies, the direction of transmission cannot be concluded. Longitudinal studies are needed in order to help elucidate whether sibling bullying is a precursor to peer bullying or vice versa.

Involvement in both sibling and peer bullying have previously been identified to have a cumulative effect on the experience and development of adverse outcomes. Children who are involved in bullying across the home and school context have been found to report higher levels of unhappiness (Wolke & Skew, 2011), loneliness (Duncan, 1999), behavioural problems (Wolke & Samara, 2004; Wolke & Skew, 2011) and mental health distress (Duncan, 1999; Tucker et al., 2013b), compared to children who are involved in either sibling or peer bullying only. Furthermore, there is evidence demonstrating that the experience of multiple life stressors or strain may result in higher levels of subsequent high-risk behaviour (Hahm, Lee, Ozonoff, & van Wert, 2010). Whether involvement in multiple kinds of bullying (home and school context) has similar cumulative effects on high-risk behaviour is unknown.

Table 3.1

Summary of Empirical Evidence on Association between Sibling Bullying and Peer Bullying

Study	Country	Sample	Age	Design	Sibling Bullying	Peer Bullying	Association: Sibling x Peer Bullying
Duncan (1999)	United States	N=375; 51.7% males	Mean 13.35	Cross-sectional	N=336 Victims (3 %); Bully-Victims (28.6%); Bullies (14.6%)	N=373 Victims (16.1%); Bully-Victims (9.1%); Bullies (19.3%)	60% of peer bully-victims reported being bullied by their siblings. 76.67% of peer bully/victims and 56.45% of peer bullies reported bullying their siblings.
Wolke & Samara (2004)	Israel	N=912; 49.1% males	Mean 13.70	Cross-sectional	Victimisation past 6 months. N=921 Victims (16.5%) (physical=3.3%; verbal=6.6%)	Victimisation past 6 months. N=921; Victims (20.5%); Bully-Victims (4.8%); Bullies (13.0%)	Sibling bullying victimisation associated with school bullying victimisation (OR=7.3; 95% CI, 4.9-10.6). 50.7% of sibling victims were school victims vs. 12.4% non-sibling victims.
Menesini et al. (2010)	Italy	N=195; 50.3% male	Range 10–12	Cross-sectional	Victimisation & Perpetration past 6 months. Prevalence: N/A	Victimisation & Perpetration past 6 months Prevalence: N/A	Sibling Victimisation x Peer Victimisation: Boys (r=0.32); Girls (0.44). Sibling Victimisation x Peer Perpetration Boys (r=0.24); Girls (r=0.39). Sibling Perpetration x Peer Victimisation Boys (r=0.09); Girls (r=0.41). Sibling Perpetration x Peer Perpetration: Boys (r=.50); Girls (r=.27).

Table 3.1

Summary of Empirical Evidence on Association between Sibling Bullying and Peer Bullying

Study	Country	Sample	Age	Design	Sibling Bullying	Peer Bullying	Association: Sibling x Peer Bullying
Wolke & Skew (2011)	United Kingdom	N=2,163; 50.1% male	Range 10–15	Cross-sectional	Victimisation & Perpetration past 6 months. 54% involved. Victims (16%); Bully-Victims (33.6%); Bullies (4.5%)	Victimisation & Perpetration past 6 months. Victimisation (12%); Preparation (1%)	14.8% of sibling victims were school victims vs. 9.3% of non-sibling victims. Sibling bully-victims were at increased odds of peer bullying victimisation.
Tucker et al. (2014)	United States	N=3,059; 51% male	Range 3–17	Cross-sectional	Victimisation past 12 months. 3-9 Years: 33.3% victimised; 10-17 Years: 14% victimised	Victimisation past 12 months. 3-9 Years: 12% victimised; 10-17 Years: 22% victimised	Sibling victimisation associated with peer victimisation in childhood (OR=1.41; 95% CI, 1.11-1.80) and adolescence (OR=1.88; 95% CI, 1.47-2.42).
Tippett & Wolke (2015)	United Kingdom	N=4,237; 49.3% male	Range 10–15 Mean 12.52	Cross-sectional	Victimisation & Perpetration past 6 months. N=4,237 Victimisation (45.8%); Perpetration (35.6%)	Victimisation & Perpetration past 6 months. N=3906; Victims (10.7%); Bully-Victims (0.9%); Bullies (2.5%)	Sibling victimisation associated with peer bullying victim status (OR=1.69; 95% CI, 1.38-2.07). Sibling perpetration associated with peer bullying bully role (OR=2.63; 95% CI, 1.69-4.09) and bully-victim role (OR=3.44; 95% CI, 1.27-9.29).

Table 3.1

Summary of Empirical Evidence on Association between Sibling Bullying and Peer Bullying

Study	Country	Sample	Age	Design	Sibling Bullying	Peer Bullying	Association: Sibling x Peer Bullying
Bar-Zomer & Klomek (2018)	Israel	N=319; 41.2% males	Range 10–17 Mean 13.50	Cross-sectional	Victimisation & Perpetration past 6 months; collapsed into one scale. Sibling Bullying Involvement (27.0%)	Victimisation & Perpetration past 6 months; collapsed into one scale. Peer Bullying Involvement (28.8%)	55.8% of children involved in sibling bullying were involved in peer bullying (OR=2.3) vs. 23.8% of children not involved in sibling bullying.
Morrill et al. (2018)	United States	N=81 17.7% males	Range 22–58 Mean 26	Retrospective	Sibling abuse victimisation & perpetration.	Victimisation & perpetration.	Sibling abuse victimisation and peer bullying victimisation were positively correlated (r = .279, p = .015). Perpetrating sibling abuse and peer bullying were positively correlated (r = .525, p = .000).

3.3.2 Sibling Bullying and Externalizing Problems and High-Risk Behaviour

Table 3.2 provides a summary of the current empirical evidence that has explored the association between sibling bullying, aggression or conflict with externalizing problems and high-risk behaviour (e.g. delinquency or substance use). The reason for including sibling conflict in this sub-section is that there are only a very small number of studies that have explored sibling bullying or aggression in relation to high-risk behaviours.

Overall, the empirical evidence presented below (Table 3.2) suggests a strong link between sibling bullying/aggression/conflict and externalizing problems (e.g. behavioural problems), as well as high-risk behaviour (e.g. delinquency or substance use). These findings may be explained with either one of the frameworks discussed in Section 3.1.

There are however several limitations that need to be addressed in future studies.

1. Most studies are cross-sectional; this hinders time-ordered conclusions to be drawn.
2. Most longitudinal studies are either limited to short follow-up periods (Natsuaki et al., 2009; Tucker et al., 2015) or are based on small sample sizes (Compton et al., 2003; Snyder et al., 2005; Solmeyer et al., 2014); this limits statistical power.
3. There is a lack of studies that concurrently explore a range of high-risk behaviour, whilst accounting for pre-existing behavioural problems, structural, family and peer influences at the same time, with the exception of Defoe et al. (2013). However, Defoe et al. (2013) only find a concurrent link between sibling negativity and externalizing problems. There is no evidence so far for a prospective association.
4. The majority of studies have investigated sibling conflict more generally (Criss & Shaw, 2005; Buist, 2010; Solmeyer et al., 2014). It is unclear whether

externalizing and high-risk behaviour outcomes may differ depending on whether children act as perpetrators or victims within the sibling relationship.

5. There is only one previous study (Toseeb et al., 2018) that has explored differential outcomes according to sibling bullying roles (non-involved, victim, bully-victim, bully), however this was cross-sectional.

Table 3.2

Summary of Empirical Evidence on Association between Sibling Bullying/Aggression/Conflict and Externalizing and High-Risk Behaviour

Study	Country	Design	Sample	Age	Sibling Construct	High-Risk Instrument	Association
Stocker et al. (2002)	United States	Longitudinal 2 Years	N=136; 58.8% male	Mean 10.2	Sibling Conflict	Delinquent Behaviour via Child Behaviour Checklist (CBCL; Achenbach, 1991)	Sibling conflict was correlated with delinquency (r=.27) two years later, even after controlling for gender, earlier adjustment, parental and family hostility.
Compton et al. (2003)	United States	Longitudinal 10 Years	N=73 Boys	Mean 6.4	Family Coercion	Antisocial Behaviour via CBCL	Family coercion predicted younger sibling antisocial behaviour 10 years later (ß=0.35, p=.009). Sibling coercion was associated with concurrent antisocial behaviour (ß=0.31, p=.001).
Bank et al. (2004)	United States	Longitudinal 4 Years	182 Boys	Range 10–12	Sibling Conflict	Covert antisocial behaviour and arrests. Elliott General Delinquency Scale; Child Behaviour Checklist (CBCL); Teacher Report Form (TRF).	Sibling conflict contributed to peer problems at 12 and was found to be associated with antisocial behaviour and arrests at 12 years. No robust findings beyond middle childhood.

Table 3.2

Summary of Empirical Evidence on Association between Sibling Bullying/Aggression/Conflict and Externalizing and High-Risk Behaviour

Study	Country	Design	Sample	Age	Sibling Construct	High-Risk Instrument	Association
Stormshak et al. (2004)	United States	Longitudinal 2 Years	N=161; 48% male	Range 12–14	Sibling Conflict	Antisocial behaviour and Drug Use via Oregon Healthy Teen Survey (OHT; Metzler et al. 1998)	Sibling conflict was unrelated to substance use.
Wolke & Samara (2004)	Israel	Cross-Sectional	N=912; 49.1% male	Mean 13.70	Sibling Bullying Victimization	Strength and Difficulties Questionnaire (SDQ, Goodman, 2001). Clinically significant behavioural problems.	Frequent sibling victimization increased the risk of clinically significant total behaviour problems (OR=3.1; 95% CI, 2.0-4.6), even after accounting for school bullying and sociodemographic variables.
Criss & Shaw (2005)	United States	Longitudinal 2 Years	N=208 Boys	Range 10–12	Sibling Relationship Quality	Delinquent Behaviour via CBCL, Teacher Report Form (TRF; Achenbach, 1991) Self-Report of Delinquency questionnaire (SRD; Elliott et al., 1985)	Sibling conflict was associated with antisocial behaviour (ß=0.18, p<.01), even after accounting for pre-existing externalizing problems.
East & Khoo (2005)	United States	Longitudinal 5 Years	N=227	Range Older 15-19 Younger	Sibling Relationship Quality	Drug and alcohol use past 6 months. High-risk sexual behaviours.	Females only: Higher sibling conflict associated with more drug/alcohol use and less sexual risk behaviours, pregnancy and STD.

Table 3.2

Summary of Empirical Evidence on Association between Sibling Bullying/Aggression/Conflict and Externalizing and High-Risk Behaviour

Study	Country	Design	Sample	Age	Sibling Construct	High-Risk Instrument	Association
				11-16			
Snyder & Burraston (2005)	United States	Longitudinal 10 Years	N=105 Boys	Mean 6.3	Coercive Sibling Exchanges	Poor Adjustment (e.g. arrests, substance use, early sexual activity); Antisocial Behaviour via Elliott Behaviour Checklist (EBC; Elliott et al., 1983)	Frequent sibling conflict at age 6-8 predicted poor adjustment, antisocial behaviour, drug use, arrest, early sexual activity and traumatic experiences 6-10 years later, even after accounting for parental influences.
Natsuaki et al. (2009)	United States	Longitudinal 3 Years	N=780	Range 10-18; T1 Mean 14.51	Sibling Aggression Perpetration	Externalizing Problems via Behaviour Problems Index (BPIl Zill, 1985).	Sibling aggression associated with externalizing problems, even after accounting for externalizing problems and harsh parenting.
Buist et al. (2010)	Netherlands	Longitudinal 3 years	N=249	Range 11-15; T1 Mean 12.4	Sibling Relationship Quality (SRQ)	Delinquency Scale of the Nijmegan Problem Behaviour List (NPBL; Vermulst & de Bruyn, 2001)	No evidence of link between SRQ and younger sibling delinquency. However, lower levels of SRQ was associated with higher levels of older sibling delinquency.
Button & Gealt (2010)	United States	Cross-sectional	N=8,122; 46% male	Range 13–18	Sibling Aggression Victimization	Substance Use via 3 items Delinquency via 6 items	Children victimized by siblings more likely to report substance use, delinquency and aggression, even after controlling for other forms of family violence.

Table 3.2

Summary of Empirical Evidence on Association between Sibling Bullying/Aggression/Conflict and Externalizing and High-Risk Behaviour

Study	Country	Design	Sample	Age	Sibling Construct	High-Risk Instrument	Association
Wolke & Skew (2011)	United Kingdom	Cross-Sectional	N=2,163; 50.1% male	Range 10-15	Sibling Bullying	Strength and Difficulties Questionnaire (SDQ, Goodman, 2001). Clinically significant behaviour problems	Total difficulties score in clinical range (>90th percentile): Bully-victims (OR=3.2; 95% CI: 2.2-4.7). Sibling or school bullying associated with unhappiness (OR=2.2; 95% CI, 1.5-3.1).
Defoe et al. (2013)	Netherlands	Longitudinal 4 Years	N=497 57% male	Mean 13.0	Negative Sibling Interactions	Externalizing problems past 6 months. (1) Youth Self Report (YSF; Achenbach, 1991); (2) Adult Self Report (ASR, Achenbach & Rescoral, 2003). E.g. alcohol/drug use, fighting etc.	Concurrent association: sibling-adolescent negative interactions and adolescent's externalizing problems. No longitudinal path from sibling-adolescent negative interactions to adolescent externalizing problems were found.
Espelage et al. (2013)	United States	Longitudinal 1.5 Years	N=1,232; 50.2% male	Range 10–15	Family Violence	Substance use: cigarettes, drunk liquor, used inhalants.	Females: direct effect from exposure to family violence to greater alcohol and drug use over time. Males: fighting and bullying perpetration mediated this effect.

Table 3.2

Summary of Empirical Evidence on Association between Sibling Bullying/Aggression/Conflict and Externalizing and High-Risk Behaviour

Study	Country	Design	Sample	Age	Sibling Construct	High-Risk Instrument	Association
Solmeyer et al. (2014)	United States	Longitudinal 5 Years	N=393	Mean 15.7	Sibling Conflict	18 risky behaviours in the past year on a 4-point scale (never – more than 10 times). I.e. smoking, skipping school, contact with police.	Sibling conflict was associated with more risky behaviours reported.
Mathis & Mueller (2015)	United States	Retrospective	N=322; 28.6% male	Mean 22.8	Sibling Aggression Perpetration & Victimization	Adult aggressive behaviour. Modified version of 13-time physical assault subscale of CTS2	Childhood sibling aggression was an independent predictor of adult aggressive behaviour, after controlling for other family violence.
Tucker et al. (2015)	United States	Longitudinal 1 Year	N=356 7th Grade 197; 11th Grade N=159	Mean 7th grade 12.6 11th grade 16.5	Sibling Aggression Perpetration (Proactive and Reactive)	Substance use via Diagnostic and Statistical Manual for Mental Disorders (DSM-IV, American Psychiatric Association, 1994). Delinquent behaviour via 11-item questionnaire (Elliott et al., 1985).	Proactive sibling aggression increased the risk for problem substance use and delinquent behaviour. Reactive sibling aggression increased the risk for delinquent behaviour. Same results after adjusting for sociodemographic and family variables, stressful life evens and prior adjustment.

Table 3.2

Summary of Empirical Evidence on Association between Sibling Bullying/Aggression/Conflict and Externalizing and High-Risk Behaviour

Study	Country	Design	Sample	Age	Sibling Construct	High-Risk Instrument	Association
Berkel et al. (2018)	United States	Cross-sectional	N=2,053	Range 5-17 Mean 10.6	Sibling Victimization (physical and property)	Delinquency sum score via 19-items in past 12 months.	Sibling victimization was related to more delinquency after controlling for the effect of child maltreatment.
Toseeb et al. (2018)	United States	Cross-Sectional	N=14,177	11 Years	Sibling Bullying	Strength and Difficulties Questionnaire (SDQ, Goodman, 2001). Externalizing symptoms: conduct and hyperactivity subscales.	Bully/victims (ß=0.46, 95% CI, 0.27-0.65, p<.001) and bullies (ß=0.62, 95% CI, 0.23-1.02, p<.05) had more externalizing symptoms vs. non-involved.

3.4 Theories Linking Sibling Bullying to Psychotic Disorder

3.4.1 Trauma Theories on the Development of Psychotic Disorder

Childhood trauma has been identified as a common risk factor implicated in the development of psychotic symptoms (Varese et al., 2012) and psychotic disorder (Bebbington et al., 2004; Fisher et al., 2010; Varese et al., 2012). There is increasing evidence that peer bullying may be considered a trauma and is equally associated with the emergence of psychotic symptoms (Cunningham, Hoy, & Shannon, 2016) as well as psychotic disorder (Bebbington et al., 2004; Trotta et al., 2013; Sourander, Gyllenberg, Klomek, Sillanmäki, Ilola, & Kumpulainen, 2016; Wolke, Lereya, Fisher, Lewis, & Zammit, 2014). We may therefore speculate, whether sibling bullying too may be related to the development of psychotic disorder. There are no specific theories that have dealt with sibling bullying or aggression. Rather the following overview makes recourse to theories of trauma and peer bullying on psychotic disorder. The mechanisms of how trauma may relate to the development of psychotic disorder are briefly reviewed.

3.4.2 Social Defeat

Social defeat can be understood as the negative experience from social exclusion or the chronic feeling of holding a subordinate position or outsider status (Selten & Canot-Graae, 2005). The social defeat hypothesis argues that in an environment of increased social competition, the continued experience of social defeat may act as an underlying mechanism linking childhood trauma to the development of psychosis and schizophrenia (Selten & Canot-Graae, 2005; Selten, van der Ven, Rutten, & Cantor-Graae, 2013; van Nierop et al., 2014). Feelings of failed struggle and losing rank have for instance been linked to negative schematic beliefs (Stowkowy et al., 2012) as well as paranoid appraisals (Valmaggia et al., 2015) in high-risk psychosis individuals. Peer bullying in particular has been speculated to induce feelings of rejection from one's immediate social environment. Indeed, there is evidence showing that peer bullying victimisation may act as a strong predictor of social defeat and has consequently been linked to increased risk of psychotic disorder (van Nierop, Dorsselaer, Bak, Myin-Gremeys, & van Winkel, 2014). In line with the social defeat

hypothesis, children who are victimised by their siblings (victims or bully-victims) may be expected to be at increased risk of developing psychotic disorder.

3.4.3 Cognitive Models

According to cognitive models, the onset of psychosis is a result of a vulnerable predisposition that is exacerbated through the experience of adverse life events, which produce emotional and cognitive changes or disruptions (Garety, Kuipers, Fowler, Freeman, & Bebbington, 2001; see Figure 3.1). Especially childhood trauma (Garety, Bebbington, Fowler, Freeman, & Kuipers, 2007) or bullying victimisation (Trotta et al., 2013) may elicit long-lasting cognitive vulnerabilities producing negative schematic beliefs about the self (e.g. poor self-image, lack of control over events) and others (e.g. hostile attribution of others' intentions) (Garety et al., 2007). Several studies have provided empirical support that dysfunctional cognitive processes (e.g. negative appraisals about the self and the world), produced by childhood trauma or bullying victimisation, are associated with psychosis (Kilcommons & Morrison, 2005; Campbell & Morrison, 2007; Hardy et al., 2016; Appiah-Kusi et al., 2017). Along these lines, sibling bullying victimisation (victim and bully-victim roles) may potentially be considered as a form of childhood adversity.

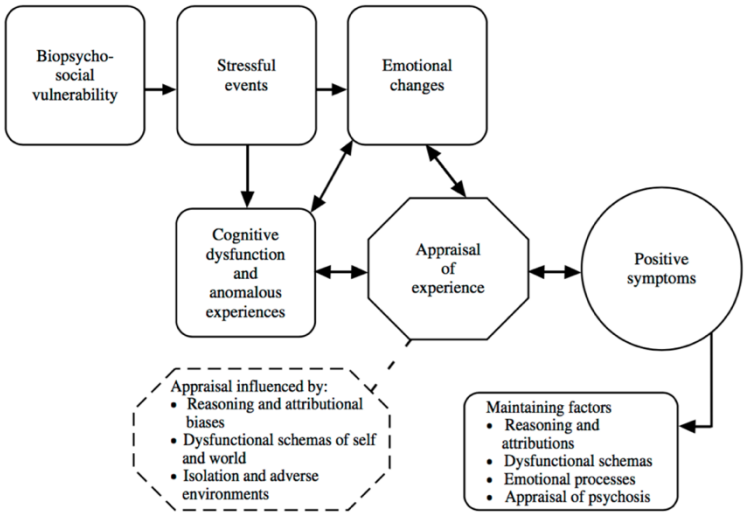

Figure 3.1

Schematic Representation of a Cognitive Model of the Positive Symptoms of Psychosis (Garety et al., 2007)

3.4.4 Biopsychosocial Models

Biopsychosocial models postulate that psychosis and schizophrenia is a product of biological and psychological processes, whereby childhood adversity heightens individuals stress sensitivity to minor life stress, resulting in physiological and neurodevelopmental alterations or increasing allostatic load (Howes & Murray, 2014; Read, Fosse, Moskowitz, & Perry, 2014). Patients with psychosis, who have also experienced childhood trauma, have for instance been found to display increased sensitivity to minor day to day stress (Collip et al., 2013; Lardinois, Lataster, Mengelers, van Os, & Myin-Germeys, 2011; Myin-Germeys, Delespaul, & van Os, 2005). A range of biological mechanisms have been put forward as possible explanations for the link between childhood adversity and psychosis. Dysregulation in the hypothalamic-pituitary-adrenal (HPA) axis (i.e. central neural system involved in stress response) has for instance been implicated in both psychosis (Bradley & Dinan, 2010) as well as bullying (Knack, Jensen-Campbell, & Baum, 2011) and childhood abuse (McCrory, de Brito, & Viding, 2012). Neurodevelopmental changes such as hippocampal volume reduction has further been related to first-episode psychosis patients and schizophrenia (Adriano, Caltagirone, & Spalletta, 2012) as well as in first-episode psychosis patients which have experienced childhood trauma (Hoy et al., 2012). Biomarkers like DNA-methylation could be a further route linking childhood adversity and psychotic disorders. Evidence from twin studies show significant differences in DNA-methylation in schizophrenic twins vs. non-schizophrenic twins (Bönsch, Wunschel, Lenz, Janssen, Weisbrod, & Sauer, 2012) as well as victimised vs. non-victimised twins (Ouellet-Morin et al., 2013). Finally, certain genetic predispositions may also help explain this relationship. The genetic variant brain-derived neurotrophic factor (BDNF) for example, has previously been identified as a strong moderating factor between childhood abuse and psychosis (Alemany et al., 2011).

3.4.5 Individual Differences and Psychotic Disorder

Compared to the general population, individuals with schizophrenia have been reported to be at an elevated risk of violent behaviour (Fazel, Gulati, Linsell, Geddes, & Grann, 2009). While the aetiology of this relationship is poorly understood, early aggressive behaviour or conduct problems are considered as a precursor to

schizophrenia (Hodgins, 2008a; Swanson, van Dorn, Swartz, Smith, Elbogen, & Monahan, 2008). Childhood deviant or antisocial behaviour has therefore been suggested as an early developmental marker for psychosis (Hodgins, Cree, Alderton & Mak, 2008b). There is some evidence from the peer bullying literature, showing that peer bullying perpetration is associated with psychotic experiences (Kelleher et al., 2008; Wolke et al., 2014). It is therefore possible, that sibling bullying perpetration (bully-victim or bully role) may act as an additional marker of psychotic disorder.

Furthermore, there is consistent evidence suggesting that individuals who report psychotic symptoms or are diagnosed with schizophrenia are found to demonstrate significant deficits in social functioning long before the onset of any symptoms (Addington, Penn, Woods, Addington, & Perkins, 2008; Cornblatt et al., 2012; Done, Crow, Johnstone, & Sacker, 1994). Social impairments have been suggested to predispose children towards victimisation (Schreier et al., 2009), with recent findings reporting that children with autism spectrum disorder have indeed been found more likely to be involved in sibling bullying (Toseeb et al., 2018). Hence, social maladjustment may be a possible mechanism that helps explain or link sibling bullying to psychotic disorder.

3.5 Empirical Evidence: Internalizing and Mental Health Problems

3.5.1 Sibling Bullying and Internalizing or Mental Health Problems

There are currently no previous studies that have explored the relationship between sibling conflict, aggression or bullying and psychotic disorder. This section will therefore review the existing literature on the association between sibling bullying and internalizing or mental health problems. Table 3.3 provides a summary of the current empirical evidence.

The evidence reviewed below indicates a robust association between sibling bullying involvement with internalizing and mental health problems, with the exception of a single study which found no relationship between sibling victimisation and emotional wellbeing (Radford, Corral, Bradley, & Fisher, 2013). Particularly children who are victimised at the hands of their siblings appear to be at a high risk of experiencing

internalizing and mental health problems (Tucker et al., 2013b, 2014a; Bowes et al., 2014; van Berkel et al., 2018; Toseeb et al., 2018). Nevertheless, there is also evidence pointing towards a link between involvement in any sibling bullying and internalizing or mental health problems (Duncan, 1999; Wolke & Skew, 2011; Tucker et al., 2014b, Coyle, Demaray, Tennant, & Klossing, 2017; Bar-Zomer & Klomek, 2018).

As reviewed in Section 3.3.1 sibling bullying that co-occurs with peer bullying has been reported to have cumulative effects on a range of negative outcomes. Exposure to multiple forms of childhood trauma (including peer bullying) has indeed been found to have cumulative effect on psychosis (Shevlin, Houston, Dorahy, & Adamson, 2008). Whether similar conclusions can be made in respect to the co-occurrence of sibling and peer bullying and psychotic disorder is unknown.

The limitations of previous studies are as follows.

1. There is only one single longitudinal study that has explored sibling bullying and mental health outcomes (Bowes et al., 2014). This study is limited to depression, self-harm and anxiety. More prospective studies that explore other mental health outcomes are needed (e.g. psychotic disorder).
2. There is only one single study that has explored differential outcomes of sibling bullying roles (non-involved, victim, bully-victim, bully) in respect to internalizing problems (Toseeb et al., 2018).
3. There are no studies that explored the relationship between sibling bullying perpetration and victimisation simultaneously in respect to mental health outcomes.
4. There are no studies that explored whether sibling bullying roles are differentially associated with mental health outcomes.
5. There are no studies that explored the relationship between sibling bullying and psychotic disorder.

Table 3.3

Summary of Empirical Evidence on Association between Sibling Bullying and Internalizing/Mental Health Problems

Study	Country	Sample	Age (years)	Design	Instrument	Association
Duncan (1999)	US	N=375; 51.7% male	Mean 13.35	Cross-sectional	Multiscore Depression Inventory for Children (MDIC; Berndt & Kaiser, 1996). Overall depression score. Children's Loneliness Questionnaire (CLQ, Asher & Wheeler, 1985).	Children involved in any sibling bullying (victim, bully/victim, bully) reported higher levels of depression and loneliness.
Finkelhor et al. (2006)	UK	N=2,030; 50% male	Range 10-15	Cross-sectional	Mental health via Trauma Symptoms Checklist for Children (TSCC; Briere, 1996).	Chronic sibling victimisation (≥5 times in past year) associated with more trauma symptoms
Wolke & Skew (2011)	UK	N=2,163; 51.1% male	Range 10-15	Cross-sectional	Unhappiness via 5-items.	Sibling or school bullying associated with unhappiness (OR=2.2; 95% CI, 1.5-3.1).

Table 3.3

Summary of Empirical Evidence on Association between Sibling Bullying and Internalizing/Mental Health Problems

Study	Country	Sample	Age (years)	Design	Instrument	Association
Radford et al. (2013)	UK	N=6,197; 34.9% parents; 36.7% young people; 28.4% young adults	Range 2m-24	Cross-sectional	Trauma Symptom Checklist for Young Children (TSCYC; Briere et al., 2001; 2 months-10 years). Trauma Symptom Checklist for Children (TSCC, Briere, 1996; 11-17 years). Trauma Symptom Checklist (Briere & Runtz, 1989; 18-24 years).	Sibling victimisation (physical, sexual or emotional) was not related to elevated trauma symptoms.
Tucker et al. (2014)	US	N=3,059; 50.2% children; 49.8% adolescents	Range 3 – 17	Cross-sectional	TSCYC; children. TSCC; adolescents. Sub-scales: anger, depression, anxiety, dissociation and post-traumatic stress.	Victimized children (M=.11, SD=.97) and adolescents (M=.13, SD=.92) reported greater mental health distress vs. non-involved children (M=-.21, SD=.84) and adolescents (M=.-.25, SD=.83).

Table 3.3

Summary of Empirical Evidence on Association between Sibling Bullying and Internalizing/Mental Health Problems

Study	Country	Sample	Age (years)	Design	Instrument	Association
Tucker et al. (2013)	US	N=3,599	Range 1m-7	Cross-sectional	TSCYC; < 9. TSCC; 10-17 years. Sub-scales: anger, depression, anxiety, dissociation and post-traumatic stress scales.	Sibling victimisation ↑ mental health distress (ß=0.15, p<.001), independent of peer bullying.
Tucker et al. (2015)	US	N=356	Mean 7th grade 12.6 11th grade 16.5	Longitudinal	Center for Epidemiological Studies Depression (CES-D) Scale (Radloff, 1977)	Reactive sibling aggression was associated with increased risk for depressed mood (p<.001).

Table 3.3

Summary of Empirical Evidence on Association between Sibling Bullying and Internalizing/Mental Health Problems

Study	Country	Sample	Age (years)	Design	Instrument	Association
Bowes et al. (2014)	UK	N=3,452	Time 1: 12 Time 2: 18	Longitudinal	Self-administered computerized version of the Clinical Interview Schedule-Revised (CIS-R: Lewis et al., 1992): Depression, anxiety, self-harm.	Sibling bullying victimisation several times a week increased odds for depression (OR=2.16; 95% CI, 1.33-3.51), self-harm (OR=2.56; 95% CI, 1.63-4.02) and anxiety (OR=1.83; 95% CI, 1.19-2.81). Results for depression and self-harm remained after accounting for family, parenting and child characteristics.
Coyle et al. (2017)	US	372 students: 58.3% male	Range 9-12	Cross-sectional	Behaviour Assessment System for Children, Second Edition, Self-Report of Personality (BASC-2 SRP): Only 3 subscales: anxiety, depression and social stress.	Sibling bullying was associated with internalizing problems (anxiety, depression and social stress) above and beyond peer bullying.

Table 3.3

Summary of Empirical Evidence on Association between Sibling Bullying and Internalizing/Mental Health Problems

Study	Country	Sample	Age (years)	Design	Instrument	Association
Berkel et al. (2018)	US	N=2,053; 53% male	Range 5-17 Mean 10.6	Cross-sectional	TSCYC for 5-9 year olds; TSCC for 10-17 year olds. Sub-scales: anger, depression, anxiety.	Sibling victimisation was related to more mental health problems above and beyond child maltreatment (physical abuse and neglect)
Bar-Zomer & Klomek (2018)	Israel	N=319 36.1% male	Range 10-17 Mean 13.5	Cross-sectional	Mood and Feelings Questionnaire (MFQ: Angold et al., 1995) to assess depression and suicidal ideation.	Children involved in sibling bullying were more likely to suffer from clinical depression ($\chi2(1) = 15.34$, $p < 0.001$) and were more likely to experience suicidal ideation $\chi2(1) = 10.436$, $p < 0.005$.
Toseeb et al. (2018)	US	14,177 children	11 years	Cross-sectional	Strength and Difficulties Questionnaire (SDQ, Goodman, 2001). Internalizing symptoms: emotional and peer problems subscales.	Victims (ß=0.44, 95% CI, 0.19-0.69 p<.001) and bully/victims (ß=0.34, 95% CI, 0.16-0.52, p<.001) had more internalizing symptoms vs. non-involved.

3.3 Conclusion and Future Directions

In this chapter, the current empirical evidence investigating the relationship between sibling bullying and adverse outcomes was reviewed. The focus of the remaining chapter was to outline some of the main theoretical perspectives lent from general theories that may help to explain why sibling bullying may be associated with high-risk behaviour or psychotic disorder. The general consensus from the literature stresses that sibling bullying is not a normal rite of passage in the development of children, but potentially a serious problem behaviour associated with poor mental health and wellbeing. While there is accumulating evidence supporting the relationship between sibling bullying and adverse outcomes, methodological shortcomings of previous studies were noted. Future directions for research and some of the main objectives of this thesis are summarized in Box 3.3.

Box 3.3 Outstanding issues in respect to sibling bullying and adverse outcomes.

Outstanding Issues

1. Sibling conflict is robustly associated with high-risk behaviour. Whether and how sibling bullying roles are associated with high-risk behaviour is unknown.
2. Sibling and peer bullying have cumulative effects on behavioural problems (Wolke & Skew, 2004; Wolke & Skew, 2011). Experiencing multiple risk factors is cumulatively associated with later aggression (Ribeaud & Eisner, 2010) and high-risk behaviour (Hahm et al., 2010). Whether sibling and peer bullying have a cumulative effect on high-risk behaviours is unknown.
3. Childhood adversity has robustly been associated with psychosis and psychotic disorder. Whether sibling bullying is associated with psychotic disorder has never been investigated.
4. Experiencing multiple types of childhood adversity is associated with psychotic disorder in a dose-response fashion (Shelvin et al., 2008). Whether experiencing sibling and peer bullying is also cumulatively associated with psychotic disorder is unknown.

CHAPTER FOUR: Research Questions

Overview: *Chapter four outlines the three research studies which form the empirical part of this thesis. The full research studies will follow in chapters six, seven and eight. This chapter serves as an introduction to the fifth chapter on methodology. It will first provide a brief rationale behind each one of the three studies and it will then summarize the main research questions addressed by each one of them.*

4.1 Study One: Trouble in the Nest: Antecedents of Sibling Bullying Victimisation and Perpetration

In order for parents and health professionals to be able to address sibling bullying, it is necessary to identify the potential antecedents which may lead to the emergence of sibling bullying. The majority of previous studies have placed an emphasis on exploring structural and parenting factors as correlates of sibling bullying (Tippett & Wolke, 2015; Updegraff et al., 2005). Moreover, most studies are cross-sectional (Menesini et al., 2010; van Berkel et al., 2018) and focus on sibling victimisation or sibling conflict more generally (Button & Gealt, 2010; Tucker et al., 2014). Prospective studies exploring early childhood predictors of specific sibling bullying roles (victims, bully-victims, bullies) are needed. Finally, while there are several theoretical perspectives addressing the emergence of sibling aggression, there are no previous studies that have tested the predictions made by different psychological theories for aggression between siblings within the family.

4.1.1 Research Questions

1. What are the early childhood (before the age of 8 years) predictors of sibling bullying roles at 12 years of age?
2. Which set of precursors show the strongest association to sibling bullying roles?
    - Structural and family characteristics
    - Parent and parenting characteristics
    - Early social experiences
    - Individual differences of the child

3. Which of the psychological theories of sibling aggression are most consistent with the findings of the empirical study?
    - Evolutionary theory
    - Social learning theory
    - Coercion theory
    - Attachment theory
    - Individual differences

4.2 Study Two: Sibling Bullying at 12 Years and High-Risk Behaviour in Early Adulthood: A Prospective Cohort Study

Sibling relationships marked by conflict or aggression have been associated with a range of high-risk behaviours (Button & Gealt, 2009; Snyder & Burraston, 2005; Solmeyer et al. 2014), there are however no previous studies that have prospectively explored the association between sibling victimisation or perpetration or specific sibling bullying roles with high-risk behaviour. Furthermore, although involvement in sibling and peer bullying has been found to have a cumulative effect on behavioural problems (Wolke & Samara, 2004; Wolke & Skew, 2011), it is unknown whether a similar dose-effect relationship exists with high-risk behaviour.

4.2.1 Research Questions

1. Is there an association between experiencing sibling bullying (victimisation or perpetration) at 12 years and high-risk behaviour (antisocial behaviour, criminal involvement, alcohol use, nicotine dependence, cannabis use, illicit drug use) at 18 or 20 years?
2. Is there a dose-response relationship between the frequency of experiencing sibling victimisation or perpetration and high-risk behaviour?
3. Is the role taken in sibling bullying (uninvolved, victim, bully, bully-victim) differentially associated with high-risk behaviour?
4. Is bullying involvement in more than one context (siblings at home and peers at school) cumulatively associated with high-risk behaviour?

4.3 Study Three: Sibling Bullying in Middle Childhood and Psychotic Disorder at 18 Years: A Prospective Cohort Study

Sibling bullying has previously been found to be associated with mental health problems in childhood and adolescence (Duncan, 1999; Tucker et al., 2014a; van Berkel et al., 2018), however there is currently only one single longitudinal study (Bowes et al., 2014). Childhood trauma has consistently been identified as a risk factor of psychotic symptoms (Varese et al., 2012) and psychotic disorder (Bebbington et al., 2004; Fisher et al., 2010). Nevertheless, there are no previous studies that have explored the association between sibling bullying and psychotic disorder. Finally, while there is evidence that involvement in sibling and peer bullying has a cumulative effect on experiencing mental health distress (Tucker et al., 2014a), it is unknown whether involvement in both sibling and peer bullying has a similar dose-effect relationship with psychotic disorder.

4.3.1 Research Questions

1. Is there an association between experiencing sibling bullying (victimisation or perpetration) at 12 years and the development of psychotic disorder by 18 years?
2. Is there a dose-response relationship between the frequency of experiencing sibling victimisation or perpetration and psychotic disorder?
3. Is the role taken in sibling bullying (victim, bully, bully-victim) differentially associated with psychotic disorder?
4. Is being victimised in more than one context (siblings at home and peers at school) cumulatively associated with psychotic disorder?

4.4 Summary

This chapter served as an introduction to the three empirical studies that will follow in chapters six, seven and eight. A brief rationale behind each one of the studies was provided and the research questions were outlined. The next chapter will aim to give an overview of the methodology that was used.

CHAPTER FIVE: Methodology

Overview: *The following chapter provides an overview of the Avon Longitudinal Study of Parents and Children data resource. The general design and sample are described and a summary of all predictor, outcome and control variables is given. Outcome variables are described in detail, whereas predictor and confounding variables are only briefly mentioned and will be described further in the methodology sections of the three separate empirical studies; corresponding to chapters six, seven and eight.*

5.1 Design of the ALSPAC Cohort

The Avon Longitudinal Study of Parents and Children (ALSPAC) is an initiative that originated during a World Health Organization (WHO) meeting in 1985, identifying the need for longitudinal birth cohort studies exploring the antecedents of ill health (Golding, Pembrey, Jones & the ALSPAC Study Team, 2001). ALSPAC was subsequently designed with the aim of examining the ways in which an individual's genotype combines with environmental influences to affect health and development (Golding et al., 2001). The sampling method of ALSPAC was opportunistic. Criteria for participation were restricted to a defined geographical area in the South West of England, comprising of the county of Avon and including three health administration districts (see Figure 5.1). All pregnant women residing in this predefined area were eligible to participate if their estimated delivery date fell between 1 April 1991 and 31 December 1992 (Boyd et al., 2013).

Data collection started in pregnancy and information across multiple time points has been obtained from a range of self-reported questionnaires (mother, father, child, child–based, school), clinical assessments (physiological, cognitive and psychological), as well as biological and genetic samples. Currently, all participants (study children) are in early adulthood. However, ALSPAC is an ongoing epidemiological study that aims for a lifelong follow-up.

Figure 5.1

The ALSPAC Eligible Study Area Within the UK Including the Three Eligible NHS District Health Authorities (Boyd et al., 2013).

5.2 Sample

5.2.1 Initial Sample

The complete eligible sample comprised of 20,248 pregnancies in Avon, England. The initial sample consisted of 14,541 (71.8%) women that were successfully enrolled antenatally. Out of these pregnancies, 195 were twins, 3 were triplets, 1 was quadruplets and 68 had no known birth outcome. There was a total of 14,062 live-born children, of which 13,988 were alive at the age of 1 year. The ALSPAC population has been reported as fairly similar when compared to the rest of Great Britain and can be considered as being representative of the UK population as a whole (Fraser et al., 2013).

5.2.2 Target Sample

The target sample comprised of all children who completed the "Brothers and Sisters" section of the "All Around Me" questionnaire that was sent out to the study children when they were on average 12.1 years old. The questionnaire was sent out to 11,132 children with a total of 7,505 (67.4%) questionnaires returned and completed. Children who reported having no siblings (N=477) were excluded from the studies. The final target sample consisted of a total of 6,988 children who completed detailed questions about sibling bullying.

5.3 Measures

An overview of all predictor, outcome and control variables included in each one of the three studies (which will follow in chapters six, seven and eight) is provided in Table 5.1.

Table 5.1

Summary of Predictor, Outcome and Control Variables Across the Three Studies

	Study One[1]	**Study Two[2]**	**Study Three[3]**
Predictor Variables	Structural family characteristics Parent and parenting characteristics Early social experiences Individual differences (Before 8 years)	Sibling bullying roles (12 years) Peer bullying (12 years)	Sibling bullying roles (12 years) Peer bullying (12 years)
Outcome Variables	Sibling bullying roles (12 years)	High-risk behaviour (18 or 20 years)	Psychotic disorder (18 years)
Control Variables	All predictor variables	Structural family characteristics Parenting characteristics Child individual differences (Before 8 years)	Structural family characteristics Parenting characteristics Child individual differences (Before 8 years)

Note: A detailed account of all predictor, outcome and control variables can be found in chapters six[1], seven[2] and eight[3].

5.3.1 Sibling Bullying

Sibling bullying was assessed via an adapted version of the Olweus Bullying Questionnaire (Olweus, 2007) when children were 12 years of age (see Figure 5.2). Children were asked to report on their experience of sibling bullying (victimisation and perpetration) over the past 6 months using the following prompt:

Sibling bullying is when a brother or sister tries to upset you by saying nasty and hurtful things, or completely ignores you from their group of friends, hits, kicks, pushes or shoves you around, tells lies or makes up false rumours about you.

Victimisation

Sibling bullying victimisation was assessed via 1-item: "In the last six months were you ever bullied by your brothers or sisters?" (Bowes et al., 2014). Responses were given on a 5-point Likert-scale: 0=never; 1=only ever once or twice; 2=2 or 3 times a month; 3=about once a week; 4=several times a week; reflecting children's sibling bullying victimisation frequency.

Perpetration

Sibling bullying perpetration was assessed via multiple items and according to the behaviour that was reported most frequently. Children were first asked: "Have you yourself ever bullied your brothers or sisters at home?". Responses were given as "yes" or "no". Children who responded with "no" were coded with the following sibling bullying perpetration frequency: 0=never. Children who responded with "yes" were asked six further questions addressing specific sibling bullying perpetration behaviours (e.g. hitting). In order for sibling bullying victimisation and perpetration response categories to be comparable, a sibling bullying perpetration frequency variable was derived. The highest frequency reported across the sibling bullying perpetration items was selected as the child's sibling bullying perpetration frequency. E.g. If a child reported hitting a brother or sister: 3=about once a week; but indicated that all other perpetration items occurred: 0=never; this child would be assigned with the following sibling bullying perpetration frequency: 3=about once a week.

Sibling Bullying Status

In the peer bullying literature, scholars often distinguish between specific bullying roles or bullying status groups (non-involved, victim, bully-victim, bully). A range of studies show that there are differential mental health and wellbeing outcomes depending on the peer bullying role assumed (Lereya et al., 2015; Wolke et al., 2013). For these reasons, it is important to similarly incorporate sibling bullying roles when exploring the antecedents and consequences of sibling bullying. Sibling bullying status variables were therefore derived in order to test differential predictors as well as long-term outcomes in relation to specific sibling bullying roles.

Sibling bullying status was derived on the basis of commonly used cut-off criteria adapted from the peer bullying literature (Wolke et al., 2013). Children reporting sibling bullying victimisation *or* perpetration less than once a week were classified as "non-involved". Children reporting sibling bullying victimisation at least once a week were classified as "victims". Children reporting sibling bullying perpetration at least once a week were classified as "bullies". Children reporting sibling bullying victimisation *and* sibling bullying perpetration at least once a week were classified as "bully-victims".

Figure 5.2 Original Sibling Bullying Questionnaire

Section B: Brothers and Sisters

B1. a) Do you have a brother or sister?

Yes [1] No [2] → **If No, go to Section C on page 11**

Now we are going to ask about **bullying by brothers or sisters.**

This means when a brother or sister tries to upset you by saying nasty and hurtful things, or completely ignores you from their group of friends, hits, kicks, pushes or shoves you around, tells lies or makes up false rumours about you.

b) What is your experience?

In the last 6 months:	**Several times a week**	**About once a week**	**2 or 3 times a month**	**Only ever once or twice**	**Never** ↓
Were you ever bullied at home by your **brothers or sisters**?	[1]	[2]	[3]	[4]	[5]

If never, go to B3 at the bottom of page 8

c) How often did your brother or sister do any of the things listed below?

	Several times a week	**About once a week**	**2 or 3 times a month**	**Only ever once or twice**	**Never** ↓
(i) I was hit, kicked, pushed or shoved around or they threatened to do this	[1]	[2]	[3]	[4]	[5]
(ii) I had things damaged or taken from me, including money	[1]	[2]	[3]	[4]	[5]

B1.c)	Several times a week	About once a week	2 or 3 times a month	Only ever once or twice	Never ↓
(iii) I was called nasty and hateful names	1	2	3	4	5
(iv) I was made fun of	1	2	3	4	5
(v) They kept me out of things on purpose, leaving me out of their group of friends or completely ignoring me	1	2	3	4	5
(vi) They told lies or spread rumours about me, or tried to make others dislike me	1	2	3	4	5
(vii) I was bullied in another way (please tick and describe)	1	2	3	4	5

.....

d) How old were you when this first happened? (for example, if you were 6 years old, write 06) **If you can't remember write 99** ☐☐ years

B2. Did you tell anybody about these things in the last 6 months?

Yes ☐1 ↓

If Yes, turn the page and go straight on

No ☐2 → **If No, go to B3 at the bottom of page 8**

If <u>Yes</u>

a) Who did you tell? (You can tick more than one)

(i) Teacher ☐ 1

(ii) Parents ☐ 1

(iii) Friends ☐ 1

(iv) Other ☐ 1 (please describe) .....

B3. a) Have **<u>you</u>** yourself ever bullied your <u>brothers or sisters</u> at home?

Yes ☐ 1 No ☐ 2 → **If <u>No</u>, go to Section C on page 11**

If <u>yes</u>,

B3. b) How often did you do any of the things listed below?

	Several times a week	About once a week	2 or 3 times a month	Only ever once or twice	Never ↓
(i) I hit, kicked, pushed or shoved a brother or sister around, or threatened to do this	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(ii) I took money or other things from a brother or sister or damaged their belongings	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(iii) I called a brother or sister nasty and hateful names	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(iv) I made fun of a brother or sister in other ways	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(v) I kept a brother or sister out of things on purpose, leaving them out of my group or completely ignoring them	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(vi) I spread rumours about a brother or sister, or tried to make others dislike them	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(vii) I bullied in another way (please tick and describe)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

.....

B3. c) How old were you when you first did this bullying?
(for example if you were six years old, write 06)
If you can't remember, write 99

☐☐ years

B4. Did you tell anybody about these things in the last 6 months?

Yes ☐1 No ☐2 → **If No, go straight to Section C**

If Yes,

a) Who did you tell? (You can tick more than one)

		Yes
(i)	Teacher	☐1
(ii)	Parents	☐1
(iii)	Friends	☐1
(iv)	Other person (please tick and describe)	☐1 .....

5.3.2 Study One

5.3.2.1 Predictor Variables

A summary of all predictor variables used in study one can be found in Table 5.2.

Table 5.2

Summary of Predictor Variables Used in Study One

Measure	Instrument	Respondent	Time-Point
Education	Mothers highest educational qualification	Mother self-report	18 weeks' gestation
Mothers social class	Occupational social class	Mother self-report	18 weeks' gestation
Financial difficulties	Affording food, clothes, heating, rent/mortgage etc.	Mother self-report	18 weeks' gestation
Maternal depression	Edinburgh Postnatal Depression Scale (Cox et al., 1987)	Mother self-report	32 weeks' gestation
Maternal anxiety	Crown-Crisp Experiential Index (Crown & Crisp, 1979)	Mother self-report	32weeks' gestation
Sex	Study child's gender	Child-based maternal report	Birth
Gestation	Child's gestation in weeks	Child-based maternal report	Birth
Birthweight	Child's birthweight in grams	Child-based maternal report	Birth
Maternal mental health	Any current mental health problems	Mother self-report	4 months
Mother-child activities	Activities engaged in with toddler	Mother self-report	6 months; 3 years
Maternal bonding	Maternal confidence and enjoyment	Mother self-report	8 and 33 months

Table 5.2

Summary of Predictor Variables Used in Study One

Measure	Instrument	Respondent	Time-Point
Domestic violence	Physical or emotional violence by partner	Mother self-report	8, 21, 33, 47 months
Maltreatment	Child physical or sexual abuse	Mother self-report	18, 30, 42 months
Suboptimal parenting	Hitting, shouting, hostility and resentment	Mother self-report	21, 24, 33, 42, 47 months
Conflicting partnership	Conflictual mother-partner exchanges	Mother self-report	22 and 33 months
Regulatory problems	Child's sleeping, crying and feeding problems	Child based maternal report	6, 15, 18, 24, 30 months
Difficult temperament	Low: rhythmicality, approach, adaptability; high: intensity, mood	Child based maternal report	24 months
Sibling aggression	Victimisation and perpetration of aggression (e.g. teasing)	Child based maternal report	5 years
Number of children	3 or more vs. less than 3 children	Mother self-report	7 years
Birth order	First born vs. later born	Mother self-report	7 years
Older brothers	Older brothers vs. no older brothers	Mother self-report	7 years
Older sisters	Older sisters vs. no older sisters	Mother self-report	7 years
Mother's marital status	Single vs. married	Mother self-report	7 years
Time spent with sibling	Frequency of involvement in joint activities	Child based maternal report	7 years
Psychiatric diagnosis	Development and Wellbeing Assessment (Goodman et al., 2000)	Child based maternal report	7 years

Table 5.2

Summary of Predictor Variables Used in Study One

Measure	Instrument	Respondent	Time-Point
Internalizing problems	Strengths and Difficulties Questionnaire (Goodman, 2001)	Child based maternal report	7 years
Externalizing problems	Strengths and Difficulties Questionnaire (Goodman, 2001)	Child based maternal report	7 years
Peer bullying	Victimisation and perpetration	Child self-report	8 years
Intelligence	Wechsler Intelligence Scale for Children – III (Wechsler et al., 1992)	Child self-report	8 years
Emotion recognition	Diagnostic Analysis of Non-Verbal Accuracy (Nowicki et al., 2994)	Child self-report	8 years
Social cognition	Skuse Social Cognition Scale (Skuse et al., 1997)	Child self-report	8 years
Self-esteem	Harter Self-Perception Profile for Children (Harter, 1985)	Child self-report	8 years
Locus of control	Nowicki-Strickland Internal-External Scale (Nowicki et al., 1979)	Child self-report	8 years
Antisocial behaviour	11-item antisocial behaviour questionnaire (e.g. shoplifting)	Child self-report	8 years

Note: A more detailed account of all high-risk behaviours can be found in chapter six.

5.3.2.2 Confounding Variables

All of the selected precursor variables listed in Table 5.2. also serve as the confounding variables in study one. The reason for this is that study aims to investigate the relative contribution of each precursor variable when directly compared to all other potential precursor variables. Hence, each precursor is controlled for each other and is entered simultaneously into the same final model.

5.3.3 Study Two

5.3.3.1 High-Risk behaviour

Study two explored a total of six high-risk behaviours in late adolescence/early adulthood. A summary of the six high-risk behaviours, the instrument used to assess them, as well as the time-point at which they were measured can be found in Table 5.3. A more detailed account of all measures can be found in chapter seven.

Table 5.3
Summary of High-Risk Behaviour

High-Risk Behaviour	Instrument	Time-point
Antisocial behaviour	12-item questionnaire: Edinburgh Study of Youth Transition and Crime (Smith & McVie, 2003)	18 & 20 years
Criminal involvement	9-items: Involvement with police, court or prison.	18 years
Alcohol use	10-item questionnaire: Alcohol Use Disorder Identification Test (Babor et al., 2001)	18 & 20 years
Nicotine dependence	Fagerstrom Test for Nicotine Dependence (Heatherton et al., 1991)	18 & 20 years
Cannabis use	Cannabis Abuse Screening Test (Legleye et al., 2011)	18 & 20 years
Illicit drug use	7-items: cocaine, amphetamines, inhalants, sedatives, hallucinogens, opioids, injected any drugs	18 & 20 years

Note: A more detailed account of all high-risk behaviours can be found in chapter seven.

5.3.3.2 Confounding Variables

A summary of all confounders used in study two can be found in Table 5.4.

Table 5.4. Summary of Control Variables in Study Two

Measure	Instrument	Respondent	Time-Point
Maternal depression	Post-natal depression	Mother self-report	18 weeks' gestation
Maternal substance use	Any substances taken during pregnancy	Mother self-report	18 weeks' gestation
Maternal education	Highest educational qualification	Mother self-report	7 years
Marital status	Married or single	Mother self-report	7 years
Other children	Number of children in household	Mother self-report	7 years
Birth order	Study child first or later born	Mother self-report	7 years
Domestic violence	Any physical or emotional cruelty from partner	Mother self-report	8 months to 4 years
Maltreatment	Any physical or sexual child abuse	Mother self-report	1 to 8 years
Child sex	Male or female	Mother self-report	Birth
Child mental health	Any Axis I Diagnosis	Child based parent and teacher report	7 years
Child emotional and behavioural problems	Emotional symptoms or conduct problems	Child based mother-report	7 years
Peer bullying	Frequent peer bullying victimisation or perpetration	Child self-report	8 years
IQ	Intelligence	Observer based test	8 years

Note: A more detailed account of all measures can be found in chapter seven.

5.3.4 Study Three

5.3.4.1 Psychotic Disorder

Psychotic experiences were assessed via the Psychosis-Like Symptoms Interview (PLIKSi) when study children were 18 years old. The PLIKSi is a semi-structured questionnaire that is based on a standardized clinical examination from the Schedule for Clinical Assessment in Neuropsychiatry (SCAN), which has been established as a reliable and valid instrument (Zammit et al., 2013). Study children were asked to report their experiences of 11 core questions pertaining to psychotic experiences since the age of 12 years. Table 5.5 below provides an overview of all core questions. A diagnosis of psychotic disorder was given if individuals reported any definite psychotic experiences that had occurred at least once per month over the past 6 months (Zammit et al., 2013). The psychotic experiences were also not attributable to the effects of sleep or fever and either caused severe distress, impacted the individuals social or occupational function or led to help seeking.

Table 5.5

Summary of Core Questions Eliciting Key Psychotic Experiences

Key Psychotic Experiences	Core Question
Auditory hallucinations	Have you ever heard voices that other people can't hear?
Visual hallucinations	Have you ever seen something or someone that other people could not see?
Delusions of being spied on	Have you ever thought you were being followed or spied on?
Delusions of persecution	Has anyone been making things hard, or purposely causing you trouble, or trying to hurt you, or plotting against you?

Table 5.5

Summary of Core Questions Eliciting Key Psychotic Experiences

Key Psychotic Experiences	Core Question
Delusions of thoughts being read	Some people believe that their thoughts can be read. Have other people ever read your thoughts?
Delusions of reference	Have you ever believed that you were being sent special messages through television or the radio, or that a programme has been arranged just for you alone?
Delusions of control	Have you ever felt that you were under control of some special power?
Delusions of grandiose ability	Have you felt that you are a very important person or that you have special powers or abilities?
Thought broadcasting	Have you ever felt that your thoughts are broadcast out loud so that other people know what you are thinking? Like on a radio, so that anyone listening could hear them?
Thought insertion	Have you ever felt that thoughts are put into your mind that are not your own?
Thought withdrawal	Have you had thoughts taken out of your mind by someone or some special force?

5.3.4.2 Confounding Variables

A summary of all confounders used in study three can be found in Table 5.6.

Table 5.6

Summary of Control Variables in Study Three

Measure	Instrument	Respondent	Time-Point
Maternal depression	Post-natal depression	Mother self-report	18 weeks' gestation
Maternal education	Highest educational qualification	Mother self-report	7 years
Marital status	Married or single	Mother self-report	7 years
Other children	Number of children in household	Mother self-report	7 years
Birth order	Study child first or later born	Mother self-report	7 years
Domestic violence	Any physical or emotional cruelty from partner	Mother self-report	8 months to 4 years
Maltreatment	Any physical or sexual child abuse	Mother self-report	1 to 8 years
Child sex	Male or female	Mother self-report	Birth
Child mental health	Any Axis I Diagnosis	Child based parent and teach report	7 years
Child emotional and behavioural problems	Emotional symptoms or conduct problems	Child based mother-report	7 years
Peer bullying	Frequent peer bullying victimisation or perpetration	Child self-report	8 years
IQ	Intelligence	Observer based test	8 years

Note: A more detailed account of all measures can be found in chapter eight.

5.4 Statistical analysis

Statistical analysis for all three studies was conducted using IBM Statistics 23.0 (IBM Corp., 2015) and STATA 14.0 (StataCorp., 2015). The following statistical methodologies have been used for the primary analyses:

- Study one: Multinomial Logistic Regression Analysis
- Study two: Binary Logistic Regression Analysis
- Study three: Binary Logistic Regression Analysis

5.4.1 Missing Data

Longitudinal studies are prone to missing data through attrition. In order to address possible bias in our findings, we performed multiple imputation analysis in each one of the three studies. Fully conditional specification equations as implemented in the Multiple Imputation by Chained Equations algorithm in Stata 14.0 were used in order to allow for a starting sample that matched the original target sample (e.g. 6,988), even after including confounder and outcome variables.

5.5 Summary

The aim of this chapter was to provide an overview and introduction to the ALSPAC data resource and allow readers to understand the methodology that has been used in the upcoming three studies corresponding to next three chapters: six, seven and eight.

CHAPTER SIX: Trouble in the Nest: Antecedents of Sibling Bullying Victimisation and Perpetration

Background: *Sibling bullying is highly prevalent and has been found to have adverse effects on mental health lasting into early adulthood. Unknown is, what predicts sibling bullying roles (uninvolved, victim, bully-victim and bully).*

Method: *This study aimed to identify precursors of sibling bullying roles in middle childhood using a large sample of 6,838 children from the Avon Longitudinal Study of Parents and Children, a prospective UK birth-cohort. The relative associations of four sets of precursors: (1) structural family characteristics, (2) parent and parenting characteristics, (3) early social experiences, and (4) child individual differences was assessed before 8 years of age.*

Results: *Structural family characteristics (being the first-born and having older brothers) and sex (being male) were the strongest predictors of sibling bullying, consistent with an evolutionary model of sibling aggression. Parenting variables, early social experiences and child individual differences made significant but smaller contributions.*

Conclusion: *These findings may help to identify at-risk families, allowing for appropriate interventions to be implemented from birth.*

Dantchev, S., & Wolke, D. (2019). Trouble in the nest: antecedents of sibling bullying victimization and perpetration. Developmental Psychology. Advance online publication. doi:10.1037/dev0000700

6.1 Introduction

Sibling relationships are ubiquitous, with studies reporting around 85% of children growing up with at least one brother or sister (Tippett & Wolke, 2014). Sibling bonds are one of the longest lasting interpersonal relationships and can benefit children's cognitive and socio-emotional development (Yucel & Yuan, 2015). However, sibling relationships are also often characterized by emotional ambivalence and experiencing escalating conflict can lead to internalizing and externalizing problems (Buist, Deković, & Prinzie, 2013).

Sibling bullying has been defined as repeated aggressive behaviour between siblings that is intended to inflict harm either physically (e.g. hitting, kicking or pushing), psychologically (e.g. saying nasty and hurtful things), socially (e.g. telling lies or spreading rumours) or property based (e.g. stealing or damaging property) and involves perceived or real power imbalance (Wolke et al., 2015). Prevalence estimates across childhood and adolescence range from 15-50% for sibling victimisation and 10-40% for perpetrating sibling bullying (Wolke et al., 2015), with victimisation rates peaking between 2-9 years (Tucker et al., 2013a). Sibling aggression is a key parental concern (Pickering & Sanders, 2015) and the most frequent form of family violence (Finkelhor et al., 2015). In contrast, it is often normalised or overlooked by parents and health professionals (Khan & Rogers, 2015).

There is increasing evidence that sibling bullying and victimisation have adverse long-term consequences including increased loneliness, peer difficulties, delinquency, internalizing, externalizing and mental health problems (Wolke et al., 2015; van Berkel et al., 2018). In order to reduce or avoid sibling aggression from emerging in the first place, it is essential to identify some of the potential risk factors. The aim of this study was to explore to what extent four potential precursor sets may predict sibling bullying; including structural family characteristic, parent and parenting characteristics, early social experiences and child individual differences.

In the peer bullying literature, children are typically classified into one of four bullying groups: uninvolved, victims, bullies or bully-victims (Wolke et al., 2001). Distinctions between these bullying status groups are important. In the peer literature, there is robust evidence showing that each specific bullying group has its own set of unique

predictors (Cook et al., 2010) and is furthermore differentially associated with a range of psychosocial and behavioural outcomes (Copeland et al., 2013; Wolke et al., 2013). It may therefore be essential to consider sibling bullying status groups within the sibling domain as well.

Several theories have been put forward to explain the emergence of sibling aggression. Evolutionary perspectives argue that siblings are natural born competitors for limited parental resources including affection, attention or material goods (Tanskanen et al., 2017). Sibling aggression over limited resources in nonhuman species is well documented (Salmon & Hehman, 2014). Studies on bird species show that in extreme cases, sibling rivalry may even result in siblicide through enforced starvation, physical aggression or eviction from the nest (Morandini & Ferrer, 2015). In humans, resource control theory (RCT; Hawley, 1999) suggests that asymmetries within a social group lead to social dominance and resource-directed agonistic behaviour is used for resource acquisition (Hawley, 1999). Siblings are inherently characterized by a power differential (e.g. differences in age, size or strength). When they face divergent interests, conflictual competitive behaviour may develop, in turn fuelling the emergence of sibling aggression (Felson, 1983; Archer, 2013). Indeed, it has been found that aggression is higher in households with more children, more brothers and by older and first-born siblings (Bowes et al., 2014; Menesini et al., 2010; Tucker, et al., 2013a). Evolutionary theories would therefore suggest that structural family characteristics that affect resource availability or access should best predict involvement in sibling bullying perpetration; either as a bully or bully-victim.

Social learning theory (SLT) proposes that aggression is learned through mechanisms of observation, reinforcement and modelling (Bandura, 1973). Children exposed to indirect or direct forms of aggression within the family may adopt maladaptive models of social interaction and enact these in the sibling context (Eriksen & Jensen, 2006; Tucker et al., 2014b). In line with SLT, children witnessing conflictual parent interactions and domestic violence or experiencing maltreatment and harsh parenting early in life are consistently found to engage in more sibling aggression (Button & Gealt, 2010; Tippett & Wolke, 2015; Updegraff, Thayer, Whiteman et al., 2005). These children may hence be at a particular risk for perpetrating sibling bullying. Early social experiences beyond the family system may equally establish unhealthy models

of interpersonal interactional styles that are applied to the sibling context. Peer bullying has for example been linked to sibling bullying (Menesini et al., 2010; Tanrikulu & Campbell, 2015). According to SLT then, exposure to early aggressive models of social interaction (parent-parent; parent-child; sibling-sibling; peer-child) should predict sibling bullying perpetration. SLT would therefore argue that parenting characteristics and early social experiences (with siblings or peers) would be the strongest predictors of sibling bully or bully-victim status.

Coercion theory (Patterson et al., 1984, Patterson,1986) further suggests that ineffective parenting (e.g. punishments including hitting or scolding) and failure to discipline a child produces coercive sibling exchanges marked by hostility. When parents are unable to intervene effectively (by ignoring or allowing negative behaviour within the family system), the sibling relationship may become a training ground through which hostility is reinforced and eventually escalates into sibling bullying (victimisation or perpetration). In support of coercion theory, inconsistent parenting, poor parental supervision and high levels of sibling conflict have been identified as early indicators of sibling aggression (Menesini et al., 2010; Tucker et al., 2014; Updegraff et al., 2005). Coercion theory would hence suggest that children who are permitted to freely engage in sibling aggression early on, will be at-risk for involvement in sibling bullying. According to coercion theory, parenting characteristics and early social experiences (between siblings) should therefore be the best predictors of involvement in any sibling bullying role.

Attachment theory (Bowlby, 1969) suggests that early parent-child interactions provide children with internal working models of social interactions, which guide children's responsiveness towards others. Children exposed to positive parenting including parental warmth allow children to form healthy relationships and have been shown to be protective against sibling aggression (Tippett & Wolke, 2015; Tucker et al., 2014; Udegraff et al., 2005). On the other hand, unresponsive and inconsistent parenting may compromise healthy models of social interaction. This may be more frequent if the mother has mental health problems (Smith, 2004). Attachment theory would therefore predict that parent and parenting characteristics; particularly positive parenting (e.g. maternal bonding with child) will act as a protective factor shielding against any form of sibling bullying involvement.

Alternatively, child individual differences may contribute to the development of sibling aggression. Indeed, children's temperament, early aggressive tendencies, psychopathology or socio-cognitive abilities have been associated with an increased risk for sibling aggression or bullying (Menesini et al., 2010; Phillips, Bowie, Wan, & Yukevich, 2016; Toseeb, McChesney, & Wolke, 2018; Song et al., 2016). The peer bullying literature further suggests that preterm-born children or those at extremely low birth weight, may be more vulnerable towards victimisation (Wolke et al., 2015). It then follows, that child individual differences may be predictive of specific sibling bullying roles; specific predictions are however difficult to make considering the lack of previous studies in respect to the domain of sibling bullying and individual differences.

Previous studies have not tested alternative predictions by these various theories. Firstly, previous studies have been largely cross-sectional and did not allow for interpretation of the direction of associations (Button & Gealt, 2010; Eriksen & Jensen, 2006; Tippett & Wolke, 2015; Tucker et al., 2014b; Udegraff et al., 2005). Secondly, only a small number of potential precursors were investigated and often predictors were not controlled for each other to determine unique independent predictors (Bowes et al., 2014; Toseeb et al., 2018). Thirdly, the focus of previous studies has been mainly on structural and parenting factors (van Berkel et al., 2018; Eriksen & Jensen, 2006; Tippett & Wolke, 2015, Tucker et al., 2014b; Udegraff et al., 2005) but neglected other potential factors such as individual differences. Finally, there is a lack of studies that distinguished between roles in sibling bullying, but just considered victims or any conflict but not who perpetrated it.

The aims of the current study were to identify precursors of sibling bullying involvement in different roles (victim, bully-victim and bully) compared to those uninvolved at 12 years using a prospective birth cohort from the UK. We investigated the relative associations of four sets of precursors to roles in sibling bullying: (1) structural family characteristics, (2) parent and parenting characteristics, (3) early social experiences, and (4) child individual differences assessed before 8 years of age.

6.2 Method

6.2.1 Study Design

The Avon Longitudinal Study of Parents and Children (ALSPAC) is a birth cohort study that recruited 14,541 pregnant women from Avon, UK with an expected delivery date between 1st April 1991 and 31st December 1992. Out of this initial number of pregnancies, where enrolled mothers had either returned at least one questionnaire or attended one "Children in Focus" clinic by the 19th of June 1999, there were 14,062 live births with 13,988 of these children still alive at the age of 12 months. A detailed report on the recruitment process of the mother and child cohorts are available in the cohort profiles (Boyd et al., 2012; Fraser et al., 2012). Children were invited to attend annual assessment clinics, including face-to-face interviews, and psychological and physical tests from 7 years onwards. Please note that the study website contains details of all the data that is available through a fully searchable data dictionary at http://www.bris.ac.uk/alspac/researchers/data-access/data-dictionary/. Ethical approval for the study was obtained from the ALSPAC Ethics and Law Committee and the Local Research Ethics Committees.

6.2.2 Sample

The starting sample consisted of all those children who successfully completed the "Brothers and Sisters" section of the "All Around Me" questionnaire administered to study children when they were on average 12.1 years old. Out of the 7,477 children who completed the questionnaire, 477 (6.4%) reported that they had no siblings at home. Children with no siblings were excluded from all further analyses. The final sample consisted of all those who completed items on both sibling bullying perpetration and victimisation (N = 6,838). An a priori analysis using G*Power (Faul, Erdfelder, Buchner, & Lang, 2009) indicated that a sample size of at least 6,185 would be sufficient to detect a small effect size (i.e. OR=1.1) using a two-tailed test, a power of .85, and an alpha level of .05. This study was therefore adequately powered.

6.2.3 Assessment of Sibling Bullying

Sibling bullying was assessed when children were 12 years old via an adapted questionnaire from the Olweus Bullying Questionnaire (Olweus, 2007) addressing

bullying between brothers and sisters (Dantchev & Wolke, 2018). Children were told that sibling bullying is "when a brother or sister tries to upset you by saying nasty and hurtful things, or completely ignores you from their group of friends, hits, kicks, pushes or shoves you around, tells lies or makes up false rumours about you". They were then asked to report on their experience of sibling bullying within the last 6 months. On a 5-point Likert scale (0=never; 1=only ever once or twice; 2=2 or 3 times a month; 3=about once a week; 4=several times a week) children were first asked to report whether they were ever bullied by a sibling at home (victimisation) and later whether they had ever bullied a sibling at home (perpetration). Children were coded into sibling bullying status groups (uninvolved, victims, bully-victims, bullies) according to the following rules: Those who reported being victimised by a sibling at least once a week were coded as "victims"; those who reported perpetrating sibling bullying at least once a week were coded as "bullies"; those who reported being victimised and perpetrating sibling bullying at least once a week were coded as "bully-victims"; while those not involved in any bullying were coded as "uninvolved" (Wolke et al., 2013). Children were also asked to report their age in years, at which they were first bullied by their siblings as well as their age at which they first bullied their siblings.

6.2.4 Developmental Precursors

In order to explore and identify potential sets of precursors of sibling bullying we grouped variables as following: 1) structural family characteristics (e.g. birth order) 2) parental and parenting characteristics (e.g. domestic violence) 3) early social experiences (e.g. sibling aggression) and 4) child individual differences (e.g. infant temperament). Table 6.1 provides an overview of all selected precursors for sibling bullying. All precursors were placed within their corresponding set and an indication of the time point at which these constructs were measured is provided.

Table 6.1
Overview of Selected Precursors to Sibling Bullying

Time Point assessed	Precursor Set			
	Structural Family Characteristics	Parental and Parenting Characteristics	Early Social Experiences	Child Individual Differences
Pregnancy	Financial difficulties Maternal social class Maternal education	Maternal depression Maternal anxiety	*****	*****
Birth	*****	*****	*****	Sex Gestation Birthweight
0-3 Years	*****	Maternal mental health Mother-child activities Maternal bonding Domestic violence Maltreatment Suboptimal parenting Conflicting partnership	*****	Regulatory problems (crying, sleeping or feeding) Difficult temperament
4-8 Years	Number of children in household Birth order Older brothers Older sisters Mother's marital status	*****	Sibling aggression (victimisation or perpetration) Time spent on activities with siblings Peer bullying (victimisation or perpetration)	Psychiatric disorders Internalizing problems Externalizing problems Intelligence Emotion recognition Social cognition Self-esteem Locus of control Antisocial behaviour

1. Structural family characteristics

Household Composition

All household composition variables were obtained when children were 7 years old. Birth order was dichotomized as first-born vs. later-born. Older brother and older sisters were coded as present or not. (Bowes et al., 2014). The number of other children living in the household was used as a continuous variable (M=1.38; SD=0.91); scores were then z-standardized (M=0; SD=1).

Socio-Demographic Characteristics

Mother's marital status was assessed by classifying maternal responses as married vs. single. Mothers were also asked to indicate their highest educational qualification. Maternal education was coded as advanced level qualification/university degree/ordinary-level qualifications vs. certificate of secondary education/vocational/none (Bowes et al., 2014). Occupational social class was assessed by dichotomizing maternal responses as professional/managerial/skilled vs. partly or unskilled occupations. (Bowes et al., 2014). Finally, mothers were asked to assess how difficult it was to afford the following: Food, clothing, heating, rent/mortgage, things needed for their child on a Likert-scale from 0-3 (0=not difficult; 3=very difficult). A sum score was constructed in order to reflect financial difficulties (M=2.91; SD=3.54), with higher scores reflecting more financial difficulties (Russel, Ford, & Russel, 2018). Scores were then z-standardized (M=0; SD=1).

2. Parental and parenting characteristics

Antenatal Mental Health

Maternal depression was assessed antenatally at 32 weeks' gestation via the 10-item Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987). Responses to individual items were given on a Likert-scale ranging from 0-3. A sum score was derived using all items and mothers were classified as reporting probable clinical post-natal major depression using a cut-off score of 13 or more (Heron et al., 2004).

Maternal anxiety was assessed antenatally at 32 weeks' gestation via the 8-item anxiety subscale taken from the Crown-Crisp Experiential Index (CCEI; Crown & Crisp, 1979). Responses to individual items were given on a Likert-scale ranging from

0-2. A sum score was derived using all items and mothers were classified as anxious if they scored above the 85th percentile (Heron, Hazen, Evans, Golding, Glover, & ALSPAC Study Team, 2004); corresponding to a score of 9 or higher out of 16 points.

Postnatal Mental Health

When children were 4 months old, mothers were asked to answer a range of items identifying whether they had any mental health problems currently including schizophrenia, anorexia nervosa, severe depression or any other psychiatric problems. Mothers who responded yes to any of these items were coded as having a mental health problem.

Conflicting Partnership

Conflicting partnership was measured according to maternal reports at 22 and 33 months. Mothers were asked about their engagement in four conflicting exchanges with their partners; arguing, not speaking, walking out of the house, shouting/calling names. Items were coded as present if either the mother, their partner, or both parties engaged in the behaviour (Winsper, Lereya, & Wolke, 2012). A conflicting partnership score was created by summing all items, with higher scores reflecting higher levels of conflicting partnership (M=2.24; SD=1.88; $\propto = 0.71$). Scores were then z- standardized (M=0; SD=1).

Domestic Violence

Domestic violence was measured via a maternal questionnaire across four time-points (8, 21, 33, 47 months; Bowen, Heron, Waylen, & Wolke, 2005). Physical violence included self-reports of being physically hurt, slapped or hit by their partner or whether their partner broke or threw things. Emotional violence included self-reports of partners being emotionally cruel to the mother. Domestic violence was considered present if mothers reported any physical or emotional violence at any time-point (Winsper et al., 2012) and was coded as 0=not present; 1=present.

Maltreatment

Child maltreatment was assessed across three time-points (18, 30, 42 months). Mothers were asked to report whether their children had ever been taken into care or whether anyone (e.g. family member, stranger etc.) had ever physically hurt or

sexually abused them previously. Maltreatment was considered present if mothers reported any incident at any time-point up to 4 years of age (Bowes et al., 2014; Lereya et al., 2015) and was coded as 0=not present; 1=present.

Suboptimal Parenting Index

Suboptimal parenting considered four behaviours or emotions: Hitting, shouting, hostility and resentment (Winsper et al., 2012). We used these factors to construct a scale focusing on early childhood only (hitting and shouting at 24 and 42 months; hostility at 21 and 47 months; resentment at 21, 33 and 47 months; see Winsper et al., 2012 for details). Each factor was coded as present or not (Winsper et al., 2012) leading to a suboptimal parenting index by summing all four factors allowing for a potential score of 0-4, where higher scores reflect higher levels of suboptimal parenting (M=2.60; SD=0.90). Scores were then z-standardized (M=0; SD=1).

Maternal Bonding

Maternal reports at 8 and 33 months assessed maternal bonding with one subscale measuring maternal confidence (six items; e.g. "I feel confident with my baby") and the other maternal enjoyment (five items; e.g. "I really enjoy my baby"). Responses were given on a 4-point Likert-scale ranging from 0-3 (0=never; 3=feels exactly that way), allowing for a range of potential scores from 0-33 at each time-point (Thomson et al., 2014). Maternal bonding scores at both time-points were totalled (M=55.82; SD=6.65; $\propto = 0.72$) in order to construct a composite score. Higher scores reflect greater maternal bonding. Scores were then z-standardized (M=0; SD=1).

Mother-Child Activities

Mothers were asked to report how often they engaged in a range of activities with their toddlers at 6 months and 3 years. At 6 months mothers were asked about 7 activities (playing, singing, showing pictures in books, playing with toys, cuddling, physical play, taking child for walks) and responses were given on a 3-point Likert-scale: 0=hardly ever; 1=occasionally; 2=often. At 3 years mothers were asked about 9 activities (bathing, feeding, singing, showing pictures in books, playing with toys, cuddling, physical play, taking child for walks, putting child to bed). Responses were harmonised in order to match the 3-point Likert-scale from the 6 month assessment ("never" and "hardly ever" response categories were collapsed into the same category

"hardly ever"): 0=hardly ever; 1=sometimes; 2=often. Mother-child activity scores were summed across both time-points allowing for a potential score of 0-34, with higher scores reflecting higher levels of mother-child activities (M=28.2; SD=3.33; $\propto$ = 0.71). Scores were then z-standardized (M=0; SD=1).

3. Early social experiences

Sibling Aggression

When children were 5 years old mothers were asked to report on sibling aggression within their household. Mother's reported on how often their child perpetrated aggression towards their siblings via 2 items (teasing and provoking; M=2.19; SD=0.98; $\propto$=0.73) and they were then asked how often their study child was victimised by their siblings (teased and provoked; M=1.98; SD=1.12 $\propto$=0.76). All responses were given on a 3-point Likert-scale (0=never; 1=sometimes; 2=often). A sum score was constructed separately for sibling aggression perpetration (ranging from 0-4) and victimisation (ranging from 0-4) with higher scores reflecting higher levels of aggression or victimisation. Both scores were then z-standardized (M=0; SD=1).

Time Spent on Activities With Siblings

When children were 7 years old mothers were asked to indicate how often their child would engage in a range of activities (e.g. "making things/drawing with siblings") with their brothers or sisters. Responses were given on a 5-point Likert-scale (0=never; 4=nearly every day). All 7 items were summed to create a sibling interaction score with higher scores reflecting more time spent together (M=26.79; SD=4.33; $\propto$ = 0.76). Scores were then standardized through conversion to z-scores (M=0; SD=1).

Peer Bullying

Peer bullying was assessed at the 8-year clinic via a modified version of the Bullying and Friendship Interview Schedule (Wolke et al., 2013). Children were asked five questions about direct (e.g. hitting) and four questions about indirect (e.g. telling rumours) peer bullying victimisation and perpetration. Children were coded as peer victims or bullies if they reported victimisation or perpetration of these items at least

4 times in the last 6 months (Wolke et al., 2013). Both peer bullying victimisation and perpetration were coded as 0=not present or 1=present.

4. Individual Differences

Sex

Children were coded as female or male.

Prematurity and birthweight

Children were coded as very preterm (VP)/very low birthweight (VLBW) if they met either of the following criteria: <32 week's gestation or <1,500 grams at birth (Wolke, Bauman, Strauss, Johnson, & Marlow, 2015b).

Infant Temperament

The Carey Infant Temperament Scale (Carey & McDevitt, 1970) was used to assess infant temperament via maternal reports when the study child was 24 months of age. The construct of the "difficult child" is derived using five of the nine Carey Infant Temperament scales (low rhythmicality, approach and adaptability; high intensity and mood) (Carey et al., 1970). We created a sum score from these 5 subscales and considered children as "difficult" if they scored greater than one standard deviation above the mean (Carey & McDevitt, 1970).

Infant Regulatory Problems

Infant regulatory problems (RP) were measured according to maternal reports on children's sleeping, crying and feeding problems during infancy. Sleeping and crying problems were assessed at 6, 18 and 30 months while feeding problems were assessed at 6, 15 and 24 months. We used a previously constructed multiple regulatory problems composite by Winsper and Wolke (2014) in order to indicate the number of regulatory problems (RP; 0=no RPs, 1=1 RP, 2=2RP, 3=3RP) children were experiencing across the following time-points: 6, 15-18 and 24-30 months. We then summed these composites into a score ranging from 0-9 (0=never a regulatory problem at any time; 9=all regulatory problems at all three time points), with higher scores indicating more regulatory problems. Scores were z-standardized (M=0; SD=1). For more details see Winsper & Wolke, (2014).

IQ

Children were administered the UK version of the Wechsler Intelligence Scale for Children – III (Wechsler, Golombok, & Rust, 1992) at the 8-year clinic to assess their intelligence (IQ; M=102.06; SD=16.54). The WISC-III was administered by trained psychologist who assessed children's IQ during the observational activities session at the clinic session. Scores were then z-standardized (M=0; SD=1).

Psychiatric Diagnoses

The Development and Wellbeing Assessment (Goodman, Ford, Richards, Gatward, & Meltzer, 2000) is a structured interview in order to assess psychiatric diagnosis within the past 6 months when children were 7 years old. Children were coded as presenting one or more DSM-IV Axis I diagnosis (N=475; 5.8%) of attention deficit hyperactivity disorder, conduct disorder, oppositional defiant disorder, depression or anxiety (Schreier et al., 2009) or none.

Internalizing and Externalizing Problems

Maternal reports in the Strengths and Difficulties Questionnaire (Goodman, 2001) was used in order to assess children's internalizing and externalizing problems at 7 years. We used the 5-item emotional subscale in order to reflect internalizing problems, with higher scores indicating more emotional problems (M=1.51; SD=1.68; $\propto$=0.67). We further used the 5-item hyperactivity and the 4-item conduct problems (peer bullying item was removed) subscales in order to assess externalizing problems (M=4.80; SD=3.17; $\propto$=0.72), with higher scores reflecting more externalizing problems. Both scores were then standardized through conversion to z-scores (M=0; SD=1).

Facial Emotion Recognition

The Diagnostic Analysis of Non-Verbal Accuracy (DANVA, Nowicki & Duke, 1994) was used in order to assess children's facial emotion recognition. DANVA was administered via a computerized task at the 8-year clinic where children were asked to recognize emotion from facial cues. Facial emotion recognition abilities were dichotomized with those children making 7 or more errors being classified with poor emotion recognition (Kothari, Skuse, Wakefield, & Micali, 2013).

Social Cognition

The 12-item Skuse social cognition scale (Skuse et al., 1997) was used in order to measure children's social cognition behaviour according to maternal reports when children were 7 years old. Mothers were asked to indicate whether a list of statements corresponded to their child's behaviour (e.g. "not aware of other people's feelings"). Responses were given on a 3-point Likert-scale with scores ranging from 0-2 (0=not true; 1=quite/sometimes true; 2=very/often true). We used a sum score ranging from 0-24 to indicate children's social cognition; with higher scores indicating higher levels of social cognition (M=2.80; SD=3.73). Scores were then z-standardized (M=0; SD=1).

Self-Esteem

Self-esteem was measured at the 8-year clinic via the shortened 12-item version Harter Self Perception Profile for Children (Harter, 1985). Trained psychologists lead a face-to-face activity session with children and collected their responses using a blinded procedure, in order to encourage truthful responses. We used the full self-esteem scale comprising of two subscales: Global self-worth and scholastic competence. Higher scores reflect higher levels of self-esteem (M=19.23; SD=3.43). Scores were then z-standardized (M=0; SD=1).

Locus of Control

Locus of control was assessed at the 8-year clinic via a short 12-item version of the Nowicki-Strickland Internal-External scale (Nowicki & Strickland, 1994) for preschool and primary school children. Trained psychologists lead a face-to-face interview with children and recorded their responses. Children's responses either reflected an internal or external locus of control. A locus of control score was constructed as the sum of all external responses given by children, with higher scores reflecting more external locus of control in children (M=5.99; SD=2.08). Scores were then z-standardized (M=0; SD=1).

Antisocial Behaviour

Antisocial behaviour was assessed at the 8-year clinic via 11 items taken from the self-report antisocial behaviour for young children questionnaire (Loeber, Stouthamer-Loeber, van Kammen, & Farrington, 1989). Children were asked to indicate whether

they had ever been involved in any of the 11 behaviours described in the items (e.g. "have you ever taken something from a shop without paying for it?"). Trained psychologists lead a face-to-face activity session with children and collected their responses using a blinded procedure, in order to encourage truthful responses. An antisocial sum score was created by adding up all items where children had responded with "yes". Higher scores reflect higher levels of antisocial behaviour (M=0.36; SD=0.85). Scores were then standardized through conversion to z-scores (M=0; SD=1).

6.3 Statistical Analysis

All analyses were performed using IBM SPSS Statistics 24 and Stata 14. In order to allow for direct comparison of effect sizes across continuous and categorical variables, all continues measures were transformed into z-scores (M=0; SD=1). All of the following analyses have been performed using standardized z-scores (of continuous variables) with odds ratios reflecting an increase of one standard deviation. Collinearity diagnostics were performed using the "collin" command in Stata. The variance inflation factor (VIF) measures the impact of collinearity among the variables in a regression model. A VIF of ≥10 or a tolerance level of 0.10 indicates significant multicollinearity (O'Briend, 2007). Further details can be found in the appendix (Appendix F – J).

First, in order to identify some of the potential precursors of sibling bullying, we ran a set of multinomial logistic regression (MLR) analysis using SPSS. Appendix B – Appendix E show the crude associations between each individual precursor variable and sibling bullying roles. For clarity, the precursors belonging to the same precursor set have been placed within the same table (Appendix B – E).

Second, fully conditional specification equations as implemented in the Multiple Imputation by Chained Equations algorithm in Stata 14 were utilized in order to address possible bias in our findings, as a result of missing data by attrition. An averaged parameter estimate of over 60 imputed datasets was used according to Rubin's rule (Little & Rubin, 2002). Imputations allowed for a starting sample of 6,838.

Third, in order to test which precursors were most strongly associated with sibling bullying, (within their corresponding precursor set) all precursors that were found independently associated with sibling bullying in the crude analysis per block were selected and entered simultaneously into the same models (Model 1 – 4) using the imputed dataset. In other words, four separate MLRs were run using the imputed dataset, one corresponding to each precursor set: (1) structural family characteristics (Model 1; Table 6.3), (2) parent and parental characteristics (Model 2; Table 6.4), (3) early social experiences (Model 3; Table 6.5), (4) individual differences (Model 4; Table 6.6).

Fifth, a final model was run (model 5; Figure 6.1 A–B), in which all significant precursors from Models 1 – 4 were selected and entered at the same time, in order to determine which precursors would survive when competing against all other remaining ones. Figure 6.1 A and Figure 6.1 B have been split into two parts in order to allow for a larger image and better readability, however both parts of the figure correspond to the results within the same model 5.

6.4 Results

6.4.1 Prevalence of Sibling Bullying Involvement

A total of 6,838 children reported on sibling bullying status with 28.1% involved in any kind of sibling bullying (victim, bully-victim or bully). The onset of sibling bullying was reported around the same time (victimisation: M=8.3, SD=2.51; perpetration: M=8.7, SD=2.38) in years. Psychological sibling bullying (i.e. name calling) was reported as the most frequent type of bullying across both children who reported victimisation (41.3%) as well as perpetration (33.9%). Further details in respect to the frequencies across all types of sibling bullying victimisation and perpetration (physical, psychological and property) can be found in Appendix A. In respect to sibling bullying groups, bully-victims made up the largest group with 11.3% of children, while 9.7% reported to be victims and 7.1% reported to be bullies. Males bullied their sibling more often than females. Prevalence of sibling bullying according to role and sex are shown in Table 6.2. Descriptive statistics of potential precursor

variables across sibling bullying roles are illustrated in Tables S2 – S5 in the online supplement.

Table 6.2

Descriptives of Sibling Bullying Status and Distribution Across Gender

		Sex	
Sibling Bullying Status	Total	Male (%)	Female (%)
Uninvolved	4,915	2,262 (46.0)	2,653 (54.0)
Victim	664	285 (42.9)	379 (57.1)
Bully-Victim	773	336 (43.5)	437 (56.5)
Bully	486	305 (62.8)	181 (37.2)

6.4.2 Structural Family Characteristics and Sibling Bullying

Details on the crude associations between structural family characteristics and sibling bullying can be found in the supplementary material (Appendix B). Imputed adjusted associations including all significant structural family characteristics (Model 1; see Table 6.3) indicated that children with older brothers were at increased risk of sibling bullying victimisation (victim or bully-victim). First-born children and those growing up in families with more children at home were more likely to perpetrate sibling bullying (bully-victim or bully). Children coming from families with more financial difficulties were at increased odds of bully-victim status). The fully adjusted Model 5, which included all four sets of precursors (see Figure 6.1 A), found that growing up in households with more children remained a significant risk-factor for sibling bullying perpetration (bully-victim: OR=1.28; 95% CI, 1.16-1.42; bully: OR=1.30; 95% CI, 1.15-1.48). Similarly, having older brothers continued to predict sibling bullying victimisation (victim: OR=1.75; 95% CI, 1.38-2.22; bully-victim: OR=1.71; 95% CI, 1.32-2.18) while being first-born was predictive of sibling bullying perpetration (bullies: OR=2.64; 95% CI, 1.92-3.69; bully-victims: OR=1.68; 95% CI, 1.36-2.30).

6.4.3 Parental and Parenting Characteristics and Sibling Bullying

Crude associations (see Appendix C) were attenuated and some predictors were no longer significant once all parental and parenting characteristics were accounted for (Model 2; see Table 6.4). Conflicting partnership as well as domestic violence remained significant predictors of bully-victim status in our imputed adjusted model. Suboptimal parenting increased the likelihood of children becoming bully-victims and bullies; while higher levels of maternal bonding protected against becoming a victim or bully-victim. Only two variables from the parenting set survived in our final imputed analysis (Model 5) (see Figure 6.1 A). Children who came from homes with conflicting partnership had increased odds of being bully-victims (OR=1.16; 95% CI, 1.05-1.28), while those experiencing suboptimal parenting were most often bullies (OR=1.123; 95% CI, 1.01-1.27).

Table 6.3

Model 1: Imputed Adjusted Odds Ratios for Sibling Bullying Status at 12Yyears According to Structural Family Characteristics

Structural family characteristics			OR (95% CI)		
N=6,838	Time point	Uninvolved	Victims	Bully-Victims	Bullies
First Born	7 years	Reference	0.91 (0.71-1.16)	**1.59 (1.25-2.02)****	**2.84 (2.10-3.83)****
Older Brothers	7 years	Reference	**1.69 (1.35-2.14)****	**1.60 (1.26-2.04)****	1.13 (0.81-1.59)
Number of Children in Household	7 years	Reference	1.09 (0.98-1.21)	**1.29 (1.17-1.41)****	**1.33 (1.18-1.49)****
> Financial Difficulties	7 years	Reference	1.08 (0.99-1.19)	**1.16 (1.07-1.26)****	1.10 (0.99-1.23)

* = p<.05; ** = p<.01. OR = Odd ratios; 95% CI = 95 percent confidence intervals.

All variables included in this table have been entered together into the same model and have thus been adjusted for one another.

The imputed dataset has been used for this analysis.

Table 6.4

Model 2: Imputed Adjusted Odds Ratios for Sibling Bullying Status at 12 Years According to Parental and Parenting Characteristics

Parental and parenting characteristics			OR (95% CI)		
N=6,838	Time point	Uninvolved	Victims	Bully-Victims	Bullies
Maternal Depression	32 weeks' gestation	Reference	1.14 (0.84-1.54)	1.08 (0.81-1.45)	0.95 (0.66-1.37)
Maternal Anxiety	32 weeks' gestation	Reference	1.24 (0.92-1.66)	0.93 (0.70-1.23)	1.10 (0.77-1.56)
Maternal Psychiatric Problems	4 months	Reference	0.90 (0.67-1.21)	1.07 (0.82-1.40)	1.25 (0.92-1.72)
Conflicting Partnership	0 – 3 years	Reference	0.98 (0.88-1.09)	**1.21 (1.09-1.34)****	1.15 (1.02-1.30)*
Maternal Bonding	0 – 3 years	Reference	**0.91 (0.83-1.00)***	**0.87 (0.80-0.95)****	0.90 (0.80-1.00)
Mother-Child Activities	0 – 3 years	Reference	0.93 (0.85-1.02)	0.94 (0.87-1.03)	1.03 (0.92-1.15)
Domestic Violence	0 – 4 years	Reference	1.14 (0.91-1.44)	**1.29 (1.04-1.61)***	0.93 (0.70-1.22)
Suboptimal Parenting	0 – 4 years	Reference	1.01 (0.91-1.11)	**1.13 (1.03-1.24)***	**1.23 (1.11-1.37)****

* = p<.05; ** = p<.01. OR = Odds ratio; 95% CI = 95 percent confidence intervals.

All variables included in this table have been entered together into the same model and have thus been adjusted for one another. The imputed dataset has been used for this analysis

6.4.4 Early Social Experiences and Sibling Bullying

Crude analysis (see Appendix D) as well as the imputed adjusted analysis (Model 3; see Table 6.5) indicated that being victimised by a sibling in preschool is a risk factor for any sibling bullying involvement in middle childhood. On the other hand, being involved in perpetrating aggression towards one's siblings in early childhood, was a specific predictor of later bully status. Moreover, spending more time on activities with siblings predicted later perpetration (bully-victim and bully). Finally, being victimised by peers increased the likelihood for involvement in any sibling bullying role, while perpetrating peer bullying was associated with the likelihood of being a sibling bully-victim. The final imputed adjusted analysis (Model 5; see Figure 6.1 B) revealed that being victimised at 5 years increased the odds of being a sibling bully-victim seven years later (OR=1.19; 95% CI, 1.06-1.35). Spending more time on activities with brothers and sisters increased the risk of sibling bullying involvement in any role (victim: OR=1.10; 95% CI, 1.02-1.22; bully-victim: OR=1.19; 95% CI, 1.08-1.32; bully: OR=1.16; 95% CI, 1.03-1.31) by 12 years. Being victimised by peers was associated with both sibling victim (OR=1.23; 95% CI, 1.01-1.50) and bully-victim (OR=1.26; 95% CI, 1.03-1.53) status.

Table 6.5

Model 3: Imputed Adjusted Odds Ratios for Sibling Bullying Status at 12 Years According to Early Social Experiences

Early social experiences			OR (95% CI)		
N=6,838	Time Point	Uninvolved	Victims	Bully-Victims	Bullies
Sibling aggression victimisation	5 years	Reference	**1.25 (0.11-1.40)****	**1.17 (1.05-1.30)****	**0.75 (0.66-0.85)****
Sibling aggression perpetration	5 years	Reference	1.04 (0.93-1.17)	1.10 (0.99-1.22)	**1.33 (1.18-1.50)****
> Time spent on activities with siblings	7 years	Reference	1.04 (0.95-1.14)	**1.17 (1.07-1.29)****	**1.17 (1.04-1.31)****
Peer victimisation	8 years	Reference	**1.33 (1.09-1.62)****	**1.42 (1.18-1.72)****	**1.32 (1.06-1.65)***
Peer perpetration	8 years	Reference	0.98 (0.67-1.43)	**1.53 (1.13-2.07)****	1.42 (0.96-2.09)

* = p<.05; ** = p<.01. OR = Odds ratios; 95% CI = 95 percent confidence intervals.

All variables included in this table have been entered together into the same model and have thus been adjusted for one another.

The imputed dataset has been used for this analysis

6.4.5 Individual Differences and Sibling Bullying

Details on the crude associations between individual differences and sibling bullying can be found in the supplementary material (see Appendix E). Imputed adjusted analysis (Model 4; see Table 6.6) found that male children were more often sibling bullies, while being male reduced the odds of becoming victims or bully-victims. Children with more externalizing problems, higher social cognition and higher levels of antisocial behaviour were at increased risk of becoming bullies and bully-victims. Having more regulatory problems in infancy made it more likely for children to become bully-victims. External locus of control increased the risk of becoming a sibling victim, while high-self-esteem was protective against becoming a victim. The imputed and fully adjusted model (Model 5; see Figure 6.1 B) found that being male protected against becoming a victim (OR=0.82; 95% CI, 0.69-0.98) or bully-victim (OR=0.76; 95% CI, 0.64-0.89), while it increased odds of becoming a bully (OR=1.69; 95% CI, 1.38-2.07). Children with higher levels of previous externalizing problems and higher levels of antisocial behaviour were more often bully-victims (externalizing: OR= 1.19; 95% CI, 1.07-1.32; antisocial: OR= 1.19; 95% CI, 1.09-1.29) and bullies (externalizing: OR= 1.22; 95% CI, 1.07-1.38; antisocial: OR= 1.20; 95% CI, 1.09-1.32). Having higher levels of social cognition similarly predicted sibling bully-victim (OR=1.30; 95% CI, 1.02-1.26) and bully (OR=1.19; 95% CI, 1.05-1.34) status. Finally, children with high-self-esteem were protected against becoming a victim (OR=0.90; 95% CI, 0.82-0.99), while those with higher levels of external locus of control were at increased risk of becoming victims (OR=1.12; 95% CI, 1.01-1.23).

Table 6.6

Model 4: Imputed Adjusted Odds Ratios for Sibling Bullying Status at 12 Years According to Individual Differences

Child Individual Differences			(OR 95% CI)		
N=6,838	Time point	Uninvolved	Victims	Bully-Victims	Bullies
Male	Birth	Reference	**0.83 (0.70-0.98)***	**0.79 (0.67-0.92)****	**1.69 (1.38-2.06)****
Difficult temperament	24 months	Reference	1.19 (0.94-1.53)	1.03 (0.81-1.31)	0.96 (0.71-1.30)
Regulatory problems	0 – 3 years	Reference	1.05 (0.96-1.14)	**1.09 (1.01-1.18)***	1.03 (0.93-1.14)
Psychiatric disorders	7 years	Reference	1.41 (0.91-2.17)	0.98 (0.65-1.46)	0.81 (0.51-1.30)
Internalizing problems	7 years	Reference	1.05 (0.96-1.15)	1.09 (1.00-1.18)	1.04 (0.93-1.16)
Externalizing problems	7 years	Reference	1.08 (0.97-1.21)	**1.19 (1.07-1.33)****	**1.23 (1.09-1.39)****
Higher social cognition	7 years	Reference	1.03 (0.90-1.17)	**1.16 (1.03-1.30)***	**1.24 (1.09-1.41)****
Poor emotion recognition	8 years	Reference	1.16 (0.92-1.45)	0.97 (0.78-1.21)	1.04 (0.81-1.35)
High self-esteem	8 years	Reference	**0.88 (0.80-0.97)****	0.93 (0.85-1.02)	0.91 (0.82-1.02)
External locus of control	8 years	Reference	**1.13 (1.02-1.26)***	1.09 (0.98-1.21)	1.02 (0.91-1.15)
Antisocial behaviour	8 years	Reference	1.05 (0.94-1.16)	**1.22 (1.13-1.33)****	**1.19 (1.09-1.31)****
IQ	8 years	Reference	1.07 (0.96-1.19)	0.98 (0.89-1.08)	1.04 (0.92-1.18)

* = p<.05; ** = p<.01. OR = Odds ratio; 95% CI = 95 percent confidence intervals.

All variables included in this table have been entered together into the same model and have thus been adjusted for one another. The imputed dataset has been used for this analysis.

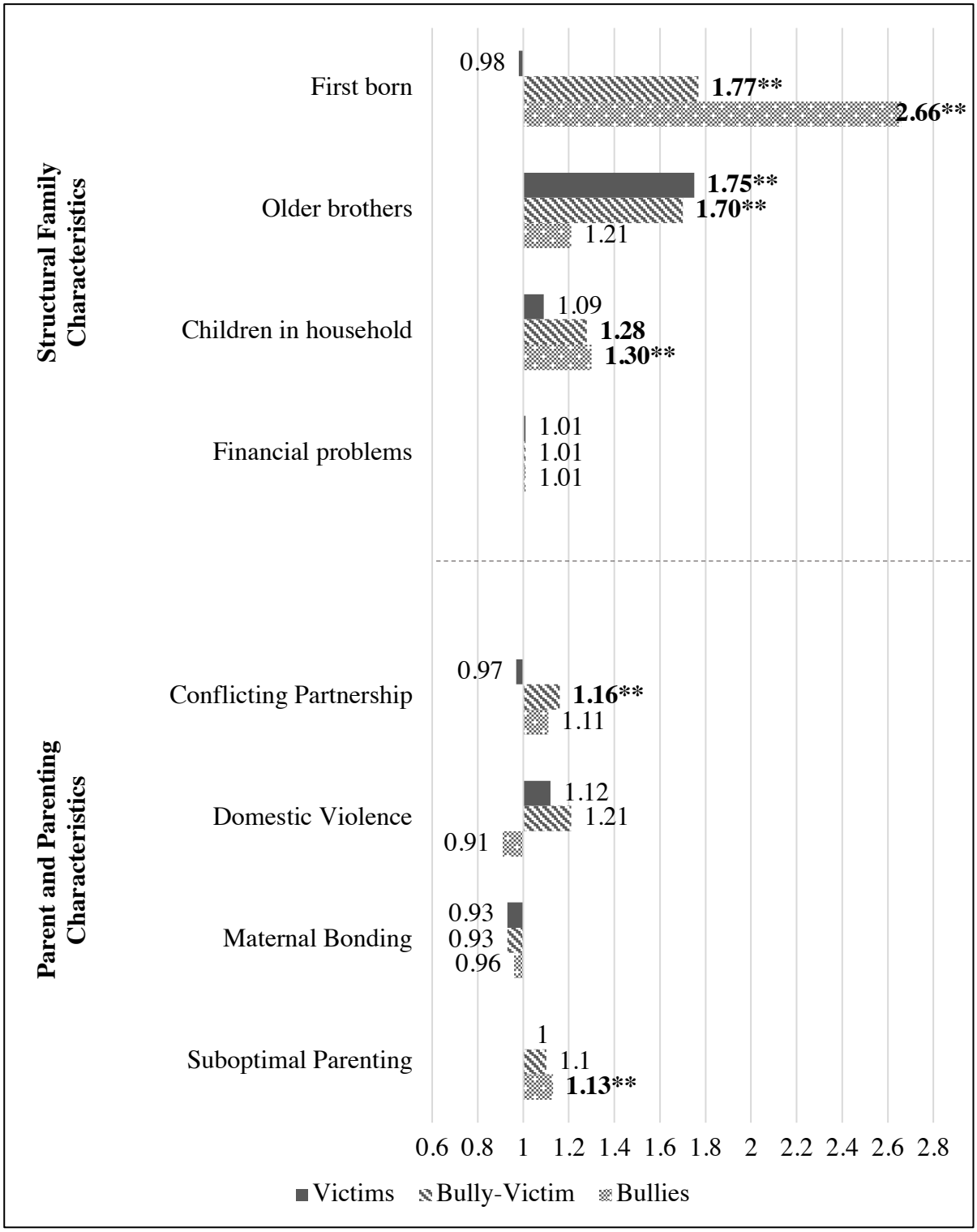

Figure 6.1 A

Model 5: Final Model Illustrating the Imputed Adjusted Odds Ratios for Sibling Bullying Status at 12 Years According to all Remaining Precursors Across the Four Sets

N = 6,831. * = p<.05; ** = p<.01.

All variables included in this table have been entered together into the same model (including also all variables illustrated in Figure 6.1 B) and have thus been adjusted for one another. The imputed dataset has been used for this analysis.

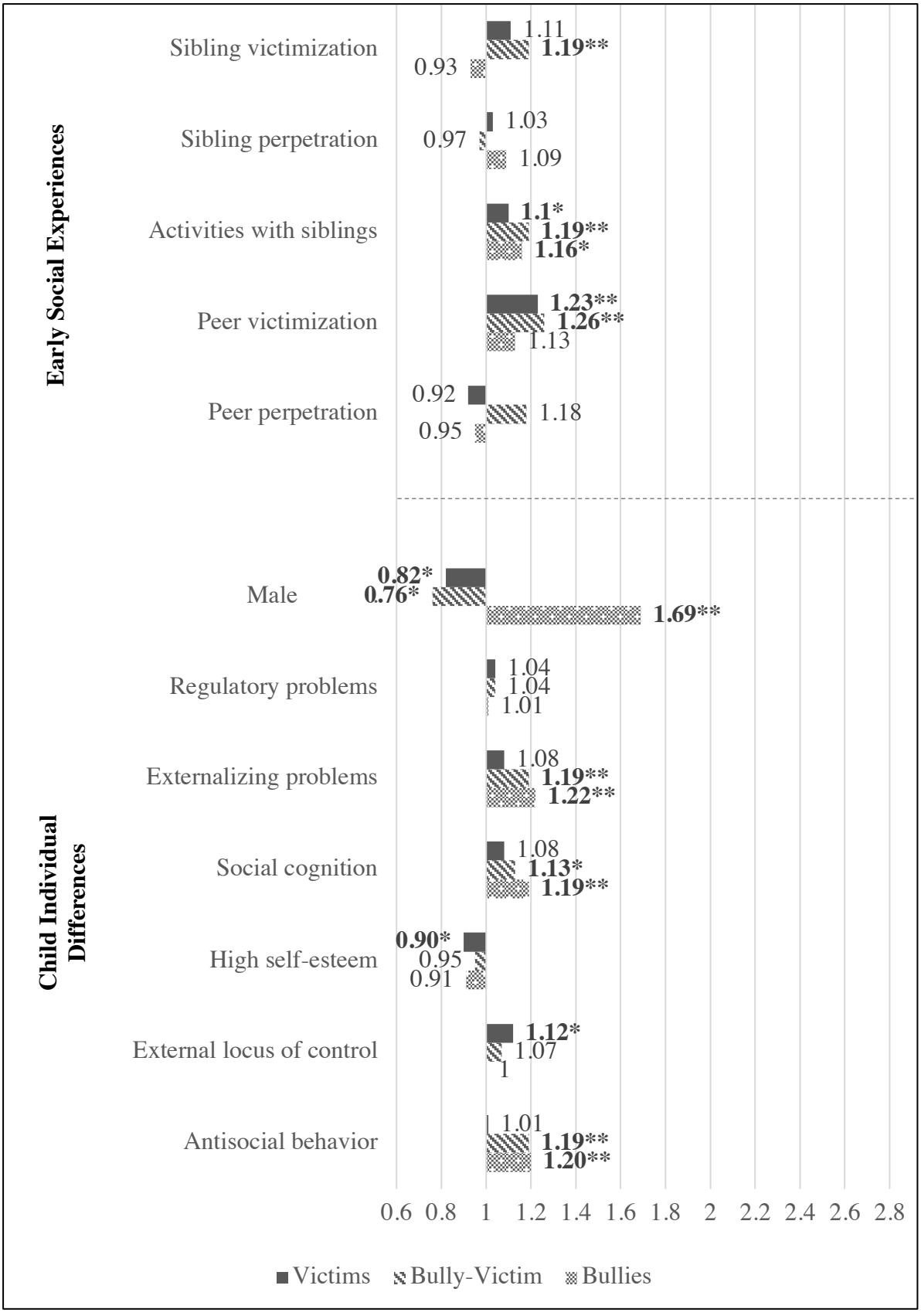

Figure 6.1 B

Model 5: Final Model Illustrating the Imputed Adjusted Odds Ratios for Sibling Bullying Status at 12 Years According to all Remaining Precursors Across the Four Sets

N = 6,831. * = p<.05; ** = p<.01.

All variables included in this table have been entered together into the same model (including also all variables illustrated in Figure 6.1 A) and have thus been adjusted for one another. The imputed dataset has been used for this analysis.

Table 6.7

Overview of Final Predictors of Sibling Bullying

Precursor Set	Victim	Bully-Victim	Bully
Structural family characteristics	Older brothers	First born Older brothers More children in the household	First born More children in the household
Parent and parenting characteristics	*****	Conflicting partnership	Suboptimal parenting
Early social experiences	More time in joint sibling activities Peer victimisation	Sibling victimisation More time in joint sibling activities Peer victimisation	More time in joint sibling activities
Child individual differences	Female Low self-esteem External locus of control	Female Externalizing problems Social cognition Antisocial behaviour	Male Externalizing problems Social cognition Antisocial behaviour

Note: N=6,838.

All precursors included in this table reflect the final fully imputed and adjusted analysis (model 5) and illustrates only those precursors that survived the final analysis ($p < .05$).

Summary

For none of the reported regression models was significant multicollinearity found (see Supplement F – J). An overview of all significant predictors of sibling bullying roles across all four sets of precursors using the final fully adjusted and imputed dataset (model 5) can be found in Table 6.7.

6.5 Discussion

To our knowledge this is the first prospective study to test a large range of potential precursors of sibling bullying roles in a systematic way. Resonating with previous studies (Toseeb et al., 2018; Wolke & Skew, 2012), the majority of children involved in sibling bullying were found to be bully-victims. This mirrors the nature of the sibling relationship which is characterized by a high degree of familiarity, allowing children to have bi-directional power over one another and thereby creating frequent opportunities for siblings to act as both the bully and the victim within their relationship (Tippett & Wolke, 2015). The findings further indicate that structural family characteristics as well as sex were the strongest predictors of sibling bullying in middle childhood, even after accounting for a range of other individual differences, parenting characteristics and social experiences in early childhood.

In line with previous cross-sectional and longitudinal studies, children who grow up in larger households were more likely to be involved in sibling bullying perpetration; male children were more often bullies, female children and those with older brothers were more often victimised (victim or bully-victim), and first-born children were more likely to be perpetrators (bullies or bully-victims) (Tippett & Wolke, 2015; Dantchev et al., 2018). Our findings support the evolutionary resource control theory arguing that sibling aggression is a consequence of competition over resources (Salmon & Hehman, 2014). Households with more children may limit availability and access to resources including parental affection, attention or material goods. Our results for sex composition and birth order further reflect the intrinsic power differential between siblings. Resource control theory asserts that individuals in asymmetrical social groups are motivated towards acquiring social dominance in order to gain desired resources (Hawley, 1999). In contrast, other family structure variables such as single mother-households, lower maternal education and social class were not found to

predict sibling bullying similar to previous research (Bowes et al., 2014; Eriksen & Jensen, 2009; Tippett & Wolke, 2015; Tucker et al., 2013) suggesting that social conditions matter less or not at all. That these social conditions of the family are not related to sibling bullying may be explained by the fact that siblings within the same family may not be concerned with the overall value of a resource as it is the same for all siblings, but it is the competition for preferential access to the resource.

Contrary to the majority of previous cross-sectional studies, parenting factors were not as strongly associated with sibling bullying (Button & Gealt, 2010; Tippett & Wolke, 2015) when controlled for other variables. Perhaps most surprising, parental maltreatment was not found to be independently associated with sibling bullying, which contrasts to other studies that suggested parent to child maltreatment as one of the strongest predictors of sibling aggression (Button & Gealt, 2010; Tucker et al., 2014). However, many previous studies did not account for other risk factors and thus potential confounders. Furthermore, parenting assessed concurrently may be misleading as it may reflect parenting reacting to sibling bullying and dealing with it, rather than a precursor or cause. Siblings may also pull together and support each other in situations where both of them are threatened with family breakdown (Beckett, 2018; Kempton, Armistead, Wierson, & Forehand, 1991; Milevsky, 2005). Nevertheless, after accounting for a range of confounders, we found that conflicting partnership was associated with bully-victim status, while suboptimal parenting (e.g. hitting child) was predictive of bully status. These results are in accordance with previous research that has reported frequent parental arguments (Hoffman et al., 2005; Tucker et al., 2014b) and harsh parenting (Erisken & Jensen, 2009; Toseeb et al., 2018) as predictive of sibling aggression. In line with social learning theory (Bandura, 1977), children that observe conflictual interpersonal interaction are at risk of adopting this model of socialization and directing it towards other social relationships (e.g. siblings). Furthermore, as suggested by attachment theory, exposure to harsh parenting may provide children with maladaptive internal working models of social relationships (Bowlby, 1969), where emotional or physical abuse become internalized as normative and useful.

In respect to early social experiences, children who were victimised by their siblings at five years were more likely to be bully-victims at twelve years. While this points to

some continuity in sibling aggression across early to middle childhood, as suggested by previous research (Menesini et al., 2010; Updegraff et al., 2005), we did not find any cross-over effects for sibling aggression perpetration, i.e. sibling aggressors in early childhood were no more likely to become sibling bullies. It is possible, that our measures of early sibling aggression were not detailed enough to detect or reflect the early sibling relationship dynamic appropriately. Future research should therefore focus on examining specific domains of the early sibling relationship dynamic in respect to sibling bullying at a later time-point. This study did however find that siblings who spent more time with one another in early childhood, were more likely to be involved in any sibling bullying status role. This supports the idea that extensive temporal involvement and familiarity is a potential vehicle that breeds contempt and hostility within the sibling relationship (Tucker et al., 2015). Moreover, peer victimisation predicted bully-victim status, partially mirroring previous work reporting on a homotypic relationship between sibling and peer aggression (Tippett & Wolke, 2015; Tanrikulu & Campbell, 2015). Hence, peer relations too can serve as early socialization models for children's behaviour within the sibling context (Bandura, 1977).

Finally, this study identified specific individual differences in children which may act as early indicators to sibling bullying. Children who display antisocial behaviour and externalizing problems in early childhood were found to be at increased risk of becoming bully-victims and bullies, suggesting that sibling bullying perpetration may be a developmental marker for a child who is already set on an antisocial behaviour trajectory (Huesmann et al., 2009). Furthermore, children who perpetrate sibling bullying either as a bully-victim or bully were found to have higher levels of social cognition in childhood. This resonates well with findings from the peer bullying literature, reporting peer bullies as highly socially skilled (Sutton et al., 1999). Peer bullies are superior to their victims in regard to their social cognition, allowing them to adapt their bullying strategies effectively according to the situation (Sutton et al., 1999; Guy, Lee, & Wolke, 2017). Similarly, children who are victimised by their siblings have more likely been reported to have autism spectrum disorder (Toseeb et al., 2018) which is characterized by poorer recognition and understanding of social cues (Kothari et al., 2013). Furthermore, children who attribute their success and failures to external factors (e.g. luck), rather than internal ones (e.g. effort) were more

often sibling victims, while high self-esteem was protective of victim status. This links well with the peer literature which has found that children who are victimised by their peers typically possess negative attitudes and beliefs about themselves (Cook et al., 2010) and that low self-esteem is a central characteristic of victimised children (Salmivalli, Kaukianen, A., Kaistaniemi, L., & Lagerpetz, 1999).

6.5.1 Strengths and Limitations

This study has several strengths. First, the longitudinal design allows for time-ordered conclusions to be drawn. Second, the use of a representative prospective birth cohort increases confidence in the generalizability of findings. Third, the inclusion of an extensive set of potential precursors and the well-controlled systematic analysis approach, reduces the risk of confounding. Fourth, multicollinearity was checked in several ways and found to be low. Thus, the estimates of the individual predictors may be considered safe within the confidence intervals. There are also limitations. Sibling bullying was assessed via self-report only. However, sibling aggression is often behind closed doors and thus parents may often be unaware of this problem behaviour (Wolke et al., 2015). A large proportion of the early childhood predictors relied on parental reports. It cannot be excluded that that this may have biased some of the findings, for example, the reporting of maltreatment or negative parenting. Future studies should aim towards a multi-informant approach. Nevertheless, it should be noted that a number of measures on child individual differences were reported by the children themselves (e.g. peer bullying or antisocial behaviour) or observer based (e.g. IQ assessment). Furthermore, including a large number of predictor variables increases the possibility of overadjustment. However, using a theory driven stepwise approach allows readers to judge and compare crude and within block associations of predictors with sibling bullying roles. Finally, in this cohort study defined by geographical area and cohort recruitment timeframe, we only had access to detailed reports about the study child. Future family studies may incorporate information about the child who is being bullied or who is bullying the study child in order to better understand the mechanisms behind sibling bullying.

6.5.2 Conclusion

Findings from this study suggest that sibling bullying is utilized as an evolutionarily driven strategy towards maintaining or achieving social dominance. Families with more children and older males are at particular risk for sibling bullying. Parents may benefit from education about how to deal with resource losses for first-borns and how to manage them in fostering improved sibling relationships. This may be important as more evidence emerges for the adverse mental health consequences for victims of sibling bullying (van Berkel et al., 2018) and interventions that may help both parents and children reduce aggression and bullying might be useful for affected families (Pickering & Sanders, 2016).

CHAPTER SEVEN: Sibling Bullying at 12 Years and High-Risk Behaviour in Early Adulthood: A Prospective Cohort Study

Background: *Emerging evidence suggests that sibling aggression is associated with the development of high-risk behaviour. This study investigated the relationship between sibling bullying perpetration and victimisation in middle childhood and high-risk behaviour in early adulthood.*

Method: *Sibling bullying was assessed at 12 years in 6,988 individuals from the Avon Longitudinal Study of Parents and Children, a birth cohort based in the UK and high-risk behavioural outcomes were assessed at 18-20 years.*

Results: *Frequent sibling bullying perpetration predicted antisocial behaviour (OR=1.74; 95% CI, 1.38-2.20), while frequent sibling bullying victimisation increased the odds of nicotine dependence (OR=2.87; 95% CI, 1.55-5.29), even after accounting for peer bullying and parent maltreatment. Categorical analysis revealed that particularly bullies and bully-victims were at risk of developing high-risk behaviour. Finally, this study found that adolescents who were involved in bullying perpetration across multiple contexts (home and school) had the highest odds of reporting antisocial behaviour (OR=3.05; 95% CI, 2.09-4.44), criminal involvement (OR=2.12; 95% CI, 1.23-3.66) and illicit drug use (OR=2.11; 95% CI, 1.44-3.08).*

Conclusion: *Findings from this study suggest that sibling bullying perpetration may be a marker of or a contributory factor along the developmental trajectory to antisocial behaviour problems. Intervention studies are needed in order to test whether reducing sibling bullying can alleviate long term adverse social and behavioural outcomes.*

Dantchev, S., & Wolke, D. (2019). Sibling bullying at 12 years and high-risk behavior in early adulthood: a prospective cohort study. Aggressive Behavior, 45, 31-45. doi:10.1002/ab.21793

7.1 Introduction

Sibling violence has been reported as the most frequent form of family violence; still aggression between siblings is largely normalized by families and societies (Caffaro, 2014). Sibling bullying further remains a neglected topic in research compared to other forms of bullying (Skinner & Kowalski, 2013). Recent evidence suggests, however, that those who are victims of sibling bullying are at greater risk for mental health problems (Tucker et al., 2013b) lasting into early adulthood (Bowes et al., 2014). There is also emerging evidence that sibling relationships marked by aggression and violence may be associated with the development of high-risk behaviour including substance use, delinquency, and antisocial behaviour (Button & Gealt, 2009; Snyder & Burraston, 2005; Solmeyer et al. 2014). Whether sibling bullying is predictive of high-risk behaviour is however unknown.

Sibling Aggression and High-Risk Behaviours

Social learning theory (SLT; Bandura, 1977) posits that behaviour is learned via mechanisms of observation and reinforcement. According to SLT, behaviour which results in a reward or desired outcome will become internalized as adaptive and later modelled in similar social interactions. On the contrary, behaviour which results in punishment or sanctions will be avoided. When parents permit or fail to intervene with physical aggression amongst siblings, children may learn that violence is rewarded with compliance and dominance (Button & Gealt, 2010) over their brother or sister. SLT would therefore predict, that children who are able to get away with perpetrating aggression towards a sibling at home will consequently internalize this maladaptive interactional style and use this method to dominate across other future contexts.

Stemming from SLT, Patterson's coercion theory (Patterson, 1982) builds on principles of reinforcement to further explain how hostile sibling interactions may escalate into antisocial behaviour. Patterson suggests that ineffective parenting results in coercive (i.e. aversive behaviour to obtain rewards) parent-child interactions that spill over onto the sibling relationship. Parents who permit repeated coercive sibling exchanges encourage the development of hostility and aggression within the family. In turn, sibling relationships may become a training ground for children to practice and internalize aggressive interactional styles that later generalize to peer relations

(Patterson, 1984; 1986). When coercive exchanges across family and peer relationships persist, they pave the path for the development of persistent antisocial behaviour (Dishion & Snyder 2016). Coercion theory would hence predict that children who predominantly engage in coercive cycles with their siblings will learn to model this behaviour beyond the family environment. Children who consequently become involved in both aggressive sibling and peer relations may further run a cumulative risk towards the development of long-term antisocial behaviour.

According to general strain theory, (GST; Agnew, 1992) exposure to stressful life events may induce negative emotions within individuals. In turn, individuals engage in corrective action including deviancy and substance use as means of overcoming these negative affective states (Agnew, 1992). Particularly harsh parenting, child abuse or peer bullying have been suggested as some of the types of strain that result in delinquency and other deviant behaviour (Agnew, 2001). GST would therefore predict that children who become victimised by their siblings may resort to high-risk behaviour as a coping mechanism in order to reduce negative feelings experienced through the strain of victimisation.

Cross-sectional and retrospective studies have identified a robust association between hostile sibling relationships and antisocial behaviour in middle childhood, adolescence and adulthood (Duncan, 1999; Compton et al., 2003; Wolke & Samara, 2004; Criss & Shaw, 2005; Button & Geal, 2010; Defoe et al., 2013; Tucker et al., 2015; Mathis & Mueller, 2015). Longitudinal studies have confirmed these findings, lending further support to a link between sibling aggression and subsequent problem behaviour (Bank et al., 2004; Buist, 2010; Natsuaki et al., 2009; Snyder & Burraston, 2005; Solmeyer et al., 2014; Stocker et al., 2002; Tucker et al., 2015). It has also been suggested that sibling conflict and aggression may predict substance use (Espelage, Low, Rao, Hong, & Little, 2013; Snyder & Burraston, 2005; Tucker et al., 2015). However, others have not found such association (East & Khoo, 2005; Stormshak et al., 2004). Furthermore, it is so far unclear whether those who perpetrate aggression or bullying are involved in more high-risk behaviour later in life or whether it is the victims who are at increased risk, as predicted by GST.

Parenting and Peer Influences

Sibling relationships do not function in isolation. Instead they are nested within multiple levels of environmental influences (Bronfenbrenner, 1979). Literature reviews on the origins of antisocial behaviour consistently identify family characteristics including ineffective parenting (i.e. hostility, abuse, domestic violence), low socioeconomic status or large family size (Farrington, 2005; Murray & Farrington, 2010) as some of the important risk factors. Maternal mental health and substance use have also been linked to children's behaviour problems (Goodman et al., 2011; Kim-Cohen, Moffitt, Taylor, Pawlby, & Caspi, 2005; Whitaker, Orzol, & Kahn, 2006). Studies on sibling aggression have found that predictions of externalizing problems are partly explained by parenting influences (Bank et al., 2004; Natsuaki, Ge, Reiss, & Neiderhiser, 2009), emphasizing the importance of considering family influences when studying the effects of sibling aggression.

Peer bullying has also received extensive attention by scholars studying antecedents of high-risk behaviour. Systematic reviews and meta-analysis investigating bullying and violence longitudinally, consistently found that perpetration is strongly associated with criminal offending and violence, even after controlling for childhood risk factors (Farrington et al. 2011; Ttofi, Farrington, Lösel, & Loeber, 2011; Ttofi et al., 2012). Children that bully their peers are also found more likely to report substance use (Bender & Lösel, 2011; Durand et al., 2013; Farrington & Ttofi, 2011; Moore et al., 2014; Sourander et al., 2007; Wolke et al., 2013). Peer bullying perpetration has further been identified as an important mechanism underlying the relationship between family violence and substance use (Espelage et al., 2013). Peer deviancy has similarly been found to mediate the link between sibling hostility and externalizing behaviour (Kim, Hetherington, & Reiss,1999; Low, Shortt, & Snyder, 2012).

To our knowledge, there is only one previous study that has longitudinally explored the relationship between negative sibling interactions and adolescent externalizing problems, after accounting for both parent and peer negativity (Defoe et al., 2013). While they did find a concurrent link between sibling negativity and externalizing problems, no longitudinal path was found.

Cumulative Sibling and Peer Influences

Children's relationship with their siblings and peers accommodate a range of similarities in terms of their nature and dynamics. Sibling aggression has been found in different cultures to be associated with involvement in peer bullying (Wolke & Samara, 2004; Tanrikulu & Campbell, 2015; Tippett & Wolke, 2015; Tucker et al., 2014) and participating in bullying at home and at school has further been shown to have a cumulative effect on experiencing behavioural problems (Wolke & Skew, 2012). Whether there is a cumulative effect of involvement in sibling and peer bullying in the context of high-risk behaviours, as predicted by coercion theory, is unknown.

Methodological Issues

While there are a number of studies supporting the link between sibling aggression and high-risk behaviour, the majority of longitudinal studies are based on small sample sizes and thus had limited statistical power (Bank et al., 2004; Buist, 2010; Snyder & Burraston, 2005; Solmeyer et al., 2014; Stocker et al., 2002) or they were limited to short follow-up periods of one to three years (Natsuaki et al., 2009; Tucker et al., 2015). What is needed are large population-based and long-term longitudinal studies that explore the association between sibling aggression and high-risk behaviour, while being able to control for potential confounders.

A further caveat is that previous studies have focused on sibling conflict more generally, thereby ignoring whether outcomes may differ for children who act as perpetrators or victims within the aggressive interaction. Studies on peer bullying suggest that children who act as both the bully and the victim may be at the highest risk of high-risk behaviour (Moore et al., 2014; Sourander et al., 2007; Wolke et al., 2013). There are however no studies that have simultaneously looked at sibling perpetration and victimisation as separate constructs or have studied different high-risk outcomes according to the sibling bullying role assumed. For the purpose of this study, we will focus on the construct of sibling bullying; which has previously been defined as any unwanted aggressive behaviour (physical, psychological or social) by a sibling that is intended to inflict harm/distress to a brother or sister and may involve a power imbalance between the siblings involved (Wolke et al., 2015).

Although sibling and peer bullying have been suggested to have cumulative effects for behaviour problems (Wolke & Skew, 2012), no studies so far have explored whether there is a similar cumulative relationship between sibling and peer bullying and high-risk behaviour.

The Present Study

The aim of the present study was to examine the relationship between sibling bullying in early adolescence on the development of high-risk behaviour in early adulthood in a UK-based longitudinal birth cohort. We investigated (1) whether the frequency of experiencing sibling bullying (victimisation or perpetration) at 12 years is associated with high-risk behaviour at 18 or 20 years; (2) whether the role taken in sibling bullying (uninvolved, victim, bully, bully-victim) is differentially associated with high-risk behaviour; and (3) whether bullying involvement in more than one context (siblings at home and peers at school) is cumulatively associated with high-risk behaviour.

We predicted that sibling bullying perpetration would be most strongly associated with high-risk behaviour and that there would be a dose-response relationship with more frequent perpetration resulting in higher odds of high-risk behaviour, as found for peer bullying previously (Farrington et al. 2011; Klomek, Sourander, & Elonheimo, 2015; Ttofi et al., 2011; Ttofi et al., 2012). We further expected that those children who acted as either pure bullies or bully-victims would show the highest odds of high-risk behaviour as previously reported for peer bullying (Klomek et al., 2015). We also predicted that involvement in sibling and peer bullying would have a cumulative relationship with engagement in high-risk behaviour in early adulthood (Tippett & Wolke, 2015; Wolke & Skew, 2012).

7.2 Methods

7.2.1 Study Design

The Avon Longitudinal Study of Parents and Children (ALSPAC) is a birth cohort study that recruited 14,541 pregnant women from Avon, UK with an expected delivery date between 1st April 1991 and 31st December 1992. Out of this initial number of

pregnancies, where enrolled mothers had either returned at least one questionnaire or attended one "Children in Focus" clinic by the 19th of June 1999, there were 14,062 live births with 13,988 of these children still alive at the age of 12 months. A detailed report on the recruitment process of the mother and child cohorts are available in the cohort profiles (Boyd et al., 2012; Fraser et al., 2012). Children were invited to attend annual assessment clinics, including face-to-face interviews, and psychological and physical tests from 7 years onwards. Please note that the study website contains details of all the data that is available through a fully searchable data dictionary at http://www.bris.ac.uk/alspac/researchers/data-access/data-dictionary/. Ethical approval for the study was obtained from the ALSPAC Ethics and Law Committee and the Local Research Ethics Committees.

7.2.2 Sample

Our starting sample was made up of all children who successfully completed a detailed assessment of sibling bullying at 12 years. The sibling bullying assessment was part of the "All Around Me" questionnaire which was sent out to eligible family's homes. Out of the 11,132 questionnaires that were sent out, 7,505 (67.4%) were returned and completed. Children with no siblings (n=477) were excluded, yielding a final starting sample of 6,988 children who completed items on sibling bullying.

7.2.3 Measures

Sibling Bullying

Sibling bullying was assessed using a sibling bullying questionnaire (Bowes et al., 2014) adapted from the Olweus Bullying Questionnaire (Olweus, 2007). Children who indicated having at least one brother or sister (93.6%) were told that they would be asked about sibling bullying, explaining that this is when a sibling tries to upset them "by saying nasty and hurtful things, or completely ignores [them] from their group of friends, hits, kicks, pushes or shoves [them] around, tells lies or makes up false rumours about [them]". Sibling bullying was used as both an ordinal (frequencies of victimisation and perpetration) and categorical variable (uninvolved, victim, bully, bully-victim). Children were first asked to report whether they had ever been bullied by a sibling at home in the past 6 months on a 5-point Likert-scale (0=never; 1=only

ever once or twice; 2=2 or 3 times a month; 3=about once a week; 4=several times a week; Bowes et al., 2014). Children were then asked to report whether they had ever bullied a sibling at home in the past 6 months. Responses were now given as "yes" or "no". Children who responded "no" were coded as 0=never. Children who responded "yes" were asked to report how frequently they had bullied a sibling according to 6-items (e.g. calling siblings nasty/hurtful names). The highest frequency reported on any given item was used to assign children a sibling perpetration frequency. Children were also asked to indicate the age at which perpetration and victimisation first started. Additionally, children were grouped into sibling bullying roles (uninvolved, victim, bully-victim, bully) if they reported the bullying behaviour either "several times a week" or "about once a week". Children were coded as "bully-victims" if they reported both victimisation and perpetration; "victims" if they reported only victimisation; "bullies" if they reported only perpetration; "uninvolved" if they reported neither victimisation nor perpetration.

Peer Bullying

Peer bullying was measured at 12 years using a 9-item version of the Bullying and Friendship Interview Schedule (Olweus, 2007). Children reported on both overt (e.g. taking personal belongings) and relational (e.g. telling lies) peer bullying perpetration and victimisation in the past 6 months. Children who reported experiencing at least one of the nine behaviours repeatedly (≥4 times in past 6 months) or very frequently (at least once per week) were coded as "victims". Children who reported perpetrating at least one of nine behaviours repeatedly or very frequently were coded as "bullies" (Schreier et al., 2009).

High-Risk Behaviour

We used measures of antisocial behaviour, criminal involvement, alcohol use, nicotine dependence, cannabis use and illicit drug use as high-risk behaviour outcomes. An illustration of our complete data sample is provided in Figure 7.1. Our final sample size ranges from 2,018 to 4,322 depending on the high-risk behaviour outcome measure fully completed 6 to 8 years later. A full list of all individual items making up the high-risk outcome variables is further provided in Figure 7.2.

Antisocial Behaviour

Antisocial behaviour was assessed at 18 and 20 years using a 12-item self-completed questionnaire adapted from the Edinburgh Study of Youth Transition and Crime (Smith & McVie, 2003). Assessment at 18 years took place at the "Teen Focus 4" (TF4) clinic session where computer-assisted interviews were completed. At 20 years questionnaires were sent out to study participants by post. Participants were asked whether they had participated in a range of antisocial activities in the past year. The Cronbach's Alpha was α=.59 at 18 and α=.54 at 20 years. As the distribution was inverse J-shaped, participants were classified as having been involved in antisocial behaviour if they reported engagement in at least one antisocial behaviour item at 18 or 20 years.

Criminal Involvement

Criminal involvement was assessed at 18 years via computer-assisted interviews at the TF4 clinic session using a set of 9 items (α=.52) reflecting involvement with the police, court or prison. Criminal involvement was coded as a dichotomized variable (1=reported involvement in one or more criminal items; 0=reported no involvement in any criminal items) seeing as frequencies on the higher end of the scale were very low (e.g. 3.1% reported involvement in more than 1 criminal activity).

Substance Use

All substance use measures (alcohol use, nicotine dependence, cannabis use, illicit drug use) at 18 years were obtained via computer-assisted interviews at the TF4 clinic session, while measures at 20 years were obtained via self-completed questionnaires that were sent directly to the study participants.

Alcohol Use

Alcohol use was assessed via the self-completed 10-item alcohol use disorder identification test (AUDIT; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001). A cut-off of 16/40 points or above was used to indicate harmful alcohol use (Kretschmer et al., 2014).

Nicotine Dependence

Nicotine dependence was assessed via the six-item Fagerstrom Test for Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerström, 1991; α=.61). The three items with yes/no response categories were scored 0 (no) and 1 (yes), while the multiple-choice items were scored from 0-3 yielding a total score range from 0-10 with higher scores indicating higher nicotine dependence. A cut-off of 6 points or higher was used to classify participants with high nicotine dependence (Fagerström, Heatherton, & Kozlowski, 1990).

Cannabis Use

Cannabis use was assessed via the six-item Cannabis Abuse Screening Test (CAST) with an internal consistency of α=.75 (Legleye, Copeland, Zammit, & Wolke, 2011). Items that were given responses of either "more often than not" or "almost always" were given the score of 1, yielding a total score range from 0-6. A cut-off of 2 points or above was used to classify participants as reporting frequent cannabis use (Legleye, Piotnek, & Kraus, 2011).

Illicit Drug Use

Illicit drug use was assessed by asking participants if they had ever used one or more illicit drugs from a list of seven. The frequency distribution was inverse J-shaped, for this reason respondents who reported using one or more drugs were classified as having used illicit drugs (e.g. 8.2% reported having ever used more than one drug).

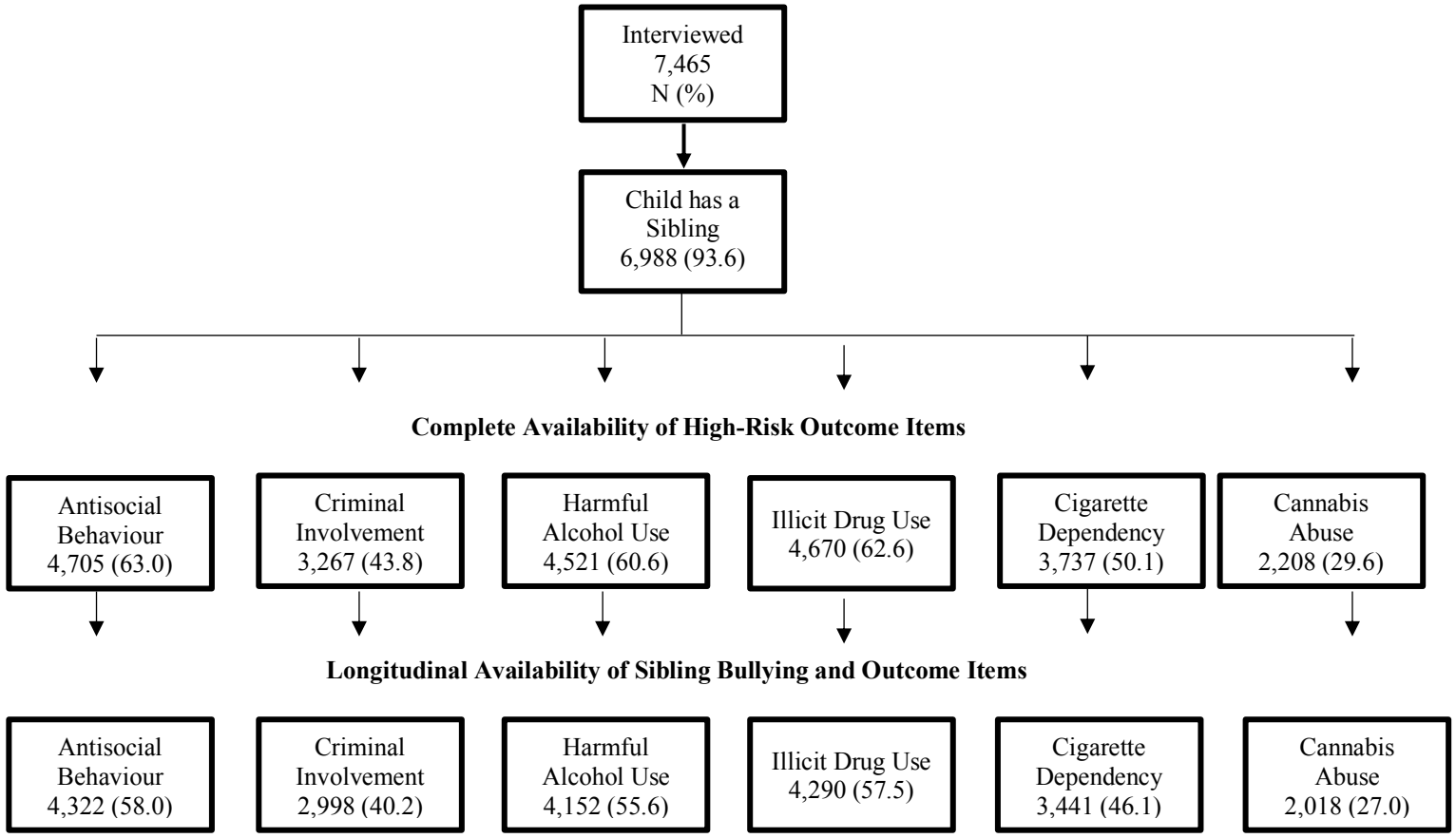

Figure 7.1

Flowchart of Sample Size Distribution Across High-Risk Behaviour Outcomes

Figure 7.2

High-Risk Behaviour Items at 18 and 20 Years

Antisocial Behaviour

- Been rowdy/rude in public
- Stolen something from a shop without paying
- Bought something you knew/suspected was stolen
- Broken into a vehicle with the intention of stealing something
- Taken/driven a vehicle without permission
- Broken into a house/building with intention to steal something
- Stolen money/something else that someone was holding/carrying/wearing
- Hit, kicked or punched someone with intention of hurting them
- Deliberately damaged/destroyed property
- Hurt/injured animals/birds on purpose
- Carried a knife/weapon for protection or in case it was needed for a fight
- Used a cheque book/credit card/cash which you knew/suspected of being stolen

Criminal Involvement

- Got in trouble with the police
- Was on trial in court for something they had done
- Received and official police caution
- Received a fine from the court
- Was given a Community Service Order
- Was given an Antisocial Behaviour Order (ASBO)
- Spent some time in a Secure Unit
- Spent some time in a Young Offenders Institution or prison
- Took part in a mediation process as an offender

Nicotine Dependence

- Number of cigarettes smoked every day on average
- How soon after waking up first cigarette is smoked
- Finds it difficult to refrain from smoking in places where it is forbidden.
- Cigarettes would be the most hated thing to give up
- Smoked more frequently during first hours after waking than during rest of day
- Smokes if they are so ill that they are in bed most of the day

Figure 7.2

High-Risk behaviour items at 18 and 20 years

Alcohol Use
Frequency of having a drink containing alcohol
Number of units had on a typical day when drinking
Frequency of having six or more units on one occasion
Frequency of feeling unable to stop drinking once started
Frequency of failing to do what is expected because of drinking
Frequency needed a first drink to get up in the morning after heavy drinking session
Frequency of feeling guilt or remorse after drinking
Frequency of being unable to remember what happened the night because of drinking
Respondent or someone else injured as a result of respondent's drinking
Relative/friend/doctor/health worker concerned about respondent drinking
Cannabis Use
Used cannabis before midday.
Used cannabis when they were alone.
Ever had memory problems when they used cannabis.
Friend/family member tells them they ought to reduce cannabis use.
Ever tried to reduce/stop cannabis use without succeeding.
Ever had problems because of their use of cannabis (fighting/argument/accident…)
Illicit Drugs
Cocaine
Amphetamines
Inhalants
Sedatives/sleeping pills
Hallucinogens
Opioids
Injected any drugs

Potential Confounders in Childhood

Previous mental health was assessed using the Development and Wellbeing Assessment (Goodman et al., 2000) based on parent and teacher reports when children were 7 years. Children were classified as presenting with no DSM-IV Axis I diagnosis (*N*=7775, 94.2%) or presenting one or more Axis I diagnoses of attention deficit hyperactivity disorder, conduct disorder, oppositional defiant disorder, depression or anxiety (Schreier et al., 2009). Internalizing and externalizing problems were assessed via the Strengths and Difficulties Questionnaire (Goodman et al., 2001) via the emotional symptoms and conduct problems subscales (α=0.70 across both subscales), based on maternal reports when the study child was 7 years. Peer bullying at 8 years was assessed using the same instrument and cut-off criteria as described for peer bullying at 12 years above. The interview asked children about peer bullying victimisation and perpetration. Children were considered as peer victims or bullies if they reported any overt or relational peer bullying several times a month or several times a week (Schreier et al., 2009). The UK version of the Wechsler Intelligence Scale for Children – III (Wechsler et al., 1992) was administered at the 8-year clinic to establish an overall score for children's intelligence quotient (grand mean=103.97; SD=16.54).

Maternal Characteristics, Household and Maltreatment

Maternal depression was assessed during pregnancy at 18 weeks' gestation via the Edinburgh Post-Natal Depression Scale (Cox et al*.,* 1987; α=0.87). Maternal substance use was also assessed at 18 weeks' gestations. Maternal reports further provided information about maternal education (certificate of secondary school education and lower or ordinary-level education and higher) and marital status (single or married) when children were between 7 and 8 years old (Bowes et al*.,* 2014). Domestic violence was assessed across four time points when children were between 8 months and 4 years and was considered as present if mothers reported any physical or emotional cruelty from their partner at any time point (Bowes et al*.,* 2014). Maltreatment was measured across seven time points (Lereya et al., 2015) when children were between 1 and 8 years and was considered present if mothers reported any physical or sexual abuse at any time point.

7.2.4 Statistical Analysis

All analyses were conducted using IBM SPSS Statistics version 23.0 and STATA version 14.0. First, we assessed the distribution of sibling bullying behaviour across all of our confounding variables, including gender. Mann Whitney U-tests and one-way ANOVA analysis were performed in order to examine individual and family characteristics across children who reported sibling perpetration and victimisation (Supplement: S1).

In order to assess whether sibling bullying in adolescence was associated with high-risk behaviour in early adulthood a set of binary logistic regression analyses were run separately for each high-risk behaviour outcome. Unadjusted analyses indicate the crude relationship between our exposure and outcome variables. Odd ratios (OR) and 95% confidence intervals (CI) are reported.

Sibling bullying was first explored as an ordinal variable, allowing us to test whether the frequency of perpetration (Table 7.1) or victimisation (Table 7.2) was related to high-risk behaviour. We also used sibling bullying as a continuous variable in order to test for a linear trend between perpetration/victimisation and high-risk behaviour.

We then tested whether the role taken in sibling bullying (uninvolved, victim, bully, bully-victim) was differentially associated with high-risk behaviour (Table 7.3). For this purpose, sibling bullying was used as a categorical variable.

Our last set of logistic regression analyses was utilized in order to assess whether bullying perpetration in multiple contexts (home and school) would result in a cumulative risk of developing high-risk behaviour (Table 7.5). An ordinal variable was created for sibling and/or peer bullying (uninvolved, either, both) and binary logistic regression analyses were conducted individually for each high-risk outcome (Supplement: S2).

Bonferroni correction (Armstrong, 2014) was applied in all logistic regression models in order to account for multiple testing and guard against type I error ($p<.0083$).
In order to pinpoint which specific high-risk behaviour items were most likely displayed by adolescents reporting sibling bullying, we performed additional post-hoc

analyses. We first used X^2 analysis to index which individual items were most often reported by adolescents. We then ran binary logistic regression analysis in order to pinpoint where the difference was (victims, bullies or bully-victims).

7.2.5 Missing Data

Fully conditional specification equations as implemented in Multiple Imputation by Chained Equations algorithm in STATA 14 were applied in addition to our crude analysis in order to account for missing data by attrition. Sociodemographic variables were included as auxiliary variables, as these have been associated with missing values in ALSPAC. We further included a range of confounding variables previously associated with high-risk behaviour into our model. Using averaged parameter estimates over 60 imputed datasets using Rubin's rules (Little & Rubin, 2002) we were able to impute up to the same starting sample as seen with our crude analyses. All logistic regression analyses outlined above were then repeated using this imputed dataset.

7.3 Results

7.3.1 Characteristics of Siblings in our Sample

A total of 6,990 (93.6%) children in our sample reported having at least one brother or sister. Out of these children, 3,251 (46.5%) were male, 2,499 (43.5%) were first-born, 1,875 (32.6%) had an older brother, 1,828 (31.8%) had an older sister and 1,923 (34.1%) children grew up in households with three or more children.

7.3.2 Prevalence and Characteristics of Sibling Bullying Involvement

Sibling bullying victimisation (M=8.3, SD=2.51) and perpetration (M=8.7, SD=2.38) was reported to have started around 8 years. Most children involved in sibling bullying were bully-victims (771/6,836) or victims (664/6,836), those who were pure bullies made up the smallest group (486/6,838). Males were more likely to be pure bullies; while no gender difference was found for the other sibling bullying roles. Associations of roles in bullying with confounding variables are shown in Appendix N.

7.3.3 Sibling Bullying Perpetration/Victimisation and High-Risk Behaviour

Children reporting bullying their brothers or sisters as little as two or three times a month were found to be 1.5 times more likely to report antisocial behaviour in early adulthood (Table 7.1; OR=1.50; 95% CI, 1.21-1.86). Children who reported perpetrating sibling bullying several times a week were furthermore at higher odds of reporting illicit drug use (OR=1.48; 95% CI, 1.17-1.88). A linear trend was identified between sibling bullying perpetration and antisocial behaviour, criminal involvement, alcohol use and illicit drug use, indicating a dose-response relationship.

Children who were victimised by their siblings several times a week were found to be almost three times more likely to report nicotine dependence in early adulthood (Table 7.2; OR=2.87; 95% CI, 1.55-5.29). A linear trend was also found for sibling bullying victimisation and nicotine dependence.

Using the imputed dataset and accounting for various confounders slightly attenuated the associations, although the majority of our findings remained significant. Associations which were no longer significant were between sibling bullying perpetration and frequent illicit drug use (Table 7.1; imputed adjusted model) and the linear trend for sibling bullying victimisation and nicotine dependence disappeared (Table 7.2; imputed adjusted model).

Table 7.1

Odds Ratios for High-Risk Behaviour at 18 or 20 Years According to Sibling Bullying Perpetration at 12 Years

Outcome OR (95% CI)	Sibling Bullying Perpetration					
	Never	Only Ever Once or Twice	2 or 3 Times a Month	About Once a Week	Several Times a Week	Linear Trend
Antisocial Behaviour (N=4,350)						
Unadjusted	Reference	1.30 (1.06-1.59)	**1.50 (1.21-1.86)**	**1.81 (1.46-2.24)**	**1.74 (1.38-2.20)**	**1.18 (1.12-1.24)**
Imputed Adjusted	Reference	**1.37 (1.11-1.69)**	**1.47 (1.18-1.84)**	**1.73 (1.39-2.15)**	**1.62 (1.27-2.07)**	**1.16 (1.10-1.22)**
Criminal Involvement (N=3,020)						
Unadjusted	Reference	1.14 (0.83-1.57)	1.46 (1.05-2.01)	1.48 (1.07-2.06)	1.56 (1.09-2.23)	**1.13 (1.06-1.22)**
Imputed Adjusted	Reference	1.19 (0.86-1.66)	1.43 (1.02-2.00)	1.37 (0.97-1.92)	1.39 (0.95-2.04)	**1.11 (1.02-1.20)**
Alcohol Use (N=4,179)						
Unadjusted	Reference	1.16 (0.96-1.41)	1.24 (1.01-1.52)	1.31 (1.06-1.62)	1.25 (0.99-1.58)	**1.08 (1.03-1.13)**
Imputed Adjusted	Reference	1.18 (0.96-1.43)	1.22 (0.99-1.51)	1.33 (1.07-1.65)	1.25 (0.98-1.58)	**1.08 (1.03-1.13)**
Illicit Drug Use (N=4,319)						
Unadjusted	Reference	1.12 (0.90-1.38)	1.25 (1.00-1.56)	1.34 (1.07-1.67)	**1.48 (1.17-1.88)**	**1.10 (1.05-1.16)**
Imputed Adjusted	Reference	1.11 (0.89-1.38)	1.18 (0.94-1.48)	1.29 (1.02-1.62)	1.36 (1.06-1.74)	**1.08 (1.03-1.14)**

Table 7.1

Odds Ratios for High-Risk Behaviour at 18 or 20 Years According to Sibling Bullying Perpetration at 12 Years

Outcome OR (95% CI)	Sibling Bullying Perpetration					
	Never	Only Ever Once or Twice	2 or 3 Times a Month	About Once a Week	Several Times a Week	Linear Trend
Nicotine Dependence (N=3,459)						
Unadjusted	Reference	1.96 (1.05-3.69)	1.33 (0.61-2.90)	1.93 (0.97-3.85)	1.86 (0.88-3.92)	1.18 (1.01-1.37)
Imputed Adjusted	Reference	1.89 (0.99-3.61)	1.35 (0.61-2.98)	1.70 (0.83-3.45)	1.56 (0.71-3.40)	1.13 (0.97-1.33)
Cannabis Use (N=2,036)						
Unadjusted	Reference	1.24 (0.69-2.24)	0.88 (0.44-1.76)	1.41 (0.77-2.59)	1.50 (0.82-2.76)	1.10 (0.96-1.25)
Imputed Adjusted	Reference	1.29 (0.71-2.35)	0.85 (0.42-1.72)	1.28 (0.69-2.40)	1.33 (0.71-2.51)	1.06 (0.93-1.22)

OR = Odds ratio. CI = Confidence intervals. Bold = p<.0083 (Bonferroni Correction). Confounders included in imputed adjusted model: gender, maternal education, marital status, maternal depression, domestic violence, maltreatment, peer bullying, child psychiatric problems, internalizing and externalizing problems, IQ. Significant confounders after Bonferroni correction: Antisocial Behaviour: single mothers, male gender. Criminal involvement = lower maternal education, single mothers, male gender. Alcohol use = higher IQ. Illicit drug use = higher IQ, single mothers, domestic violence and maltreatment present. Nicotine dependence = none. Cannabis = male gender.

Table 7.2

Odds Ratios for High-Risk Behaviour at 18 or 20 Years According to Sibling Bullying Victimisation at 12 Years

Outcome OR (95% CI)	Sibling Bullying Victimisation					
	Never	Only Ever Once or Twice	2 or 3 Times a Month	About Once a Week	Several Times a Week	Linear Trend
Antisocial Behaviour (N=4,362)						
Unadjusted	Reference	1.26 (1.06-1.51)	1.20 (0.95-1.51)	1.24 (0.99-1.56)	1.25 (1.01-1.55)	1.06 (1.02-1.11)
Imputed Adjusted	Reference	1.27 (1.06-1.53)	1.19 (0.93-1.52)	1.28 (1.01-1.62)	1.24 (0.99-1.54)	1.06 (1.01-1.11)
Criminal Involvement (N=3,028)						
Unadjusted	Reference	1.07 (0.81-1.40)	1.00 (0.69-1.44)	0.92 (0.64-1.32)	1.02 (0.73-1.42)	0.99 (0.93-1.07)
Imputed Adjusted		1.09 (0.81-1.45)	0.98 (0.67-1.44)	0.97 (0.67-1.41)	0.95 (0.67-1.36)	0.99 (0.92-1.06)
Alcohol Use (N=4,190)						
Unadjusted	Reference	1.08 (0.91-1.28)	0.93 (0.75-1.16)	1.25 (1.00-1.56)	1.04 (0.85-1.27)	1.02 (0.98-1.07)
Imputed Adjusted	Reference	1.09 (0.92-1.29)	0.92 (0.73-1.14)	**1.28 (1.03-1.60)**	1.06 (0.87-1.31)	1.03 (0.98-1.08)
Illicit Drug Use (N=4,330)						
Unadjusted	Reference	1.19 (0.99-1.43)	1.01 (0.79-1.30)	1.24 (0.98-1.56)	1.18 (0.95-1.47)	1.05 (1.00-1.10)
Imputed Adjusted	Reference	1.15 (0.95-1.39)	0.95 (0.74-1.22)	1.21 (0.95-1.53)	1.11 (0.88-1.39)	1.03 (0.98-1.08)

Table 7.2

Odds Ratios for High-Risk Behaviour at 18 or 20 Years According to Sibling Bullying Victimisation at 12 Years

Outcome OR (95% CI)	Sibling Bullying Victimisation					
	Never	Only Ever Once or Twice	2 or 3 Times a Month	About Once a Week	Several Times a Week	Linear Trend
Nicotine Dependence (N=3,469)						
Unadjusted	Reference	1.73 (0.93-3.21)	1.92 (0.90-4.10)	1.18 (0.49-2.88)	**2.87 (1.55-5.29)**	**1.24 (1.07-1.43)**
Imputed Adjusted	Reference	1.58 (0.83-2.97)	1.80 (0.83-3.91)	0.96 (0.39-2.39)	**2.26 (1.19-4.31)**	1.17 (1.01-1.36)
Cannabis Use (N=2,040)						
Unadjusted	Reference	0.87 (0.50-1.52)	1.26 (0.66-2.39)	0.85 (0.41-1.74)	1.18 (0.66-2.13)	1.03 (0.90-1.17)
Imputed Adjusted	Reference	0.85 (0.48-1.50)	1.23 (0.64-2.36)	0.83 (0.40-1.74)	1.14 (0.62-2.09)	1.02 (0.89-1.17)

OR = Odds ratio. CI = Confidence intervals. Bold =p<.0083 (Bonferroni Correction).

Confounders included in imputed adjusted model: gender, maternal depression, domestic violence, maltreatment, peer bullying, child psychiatric problems, internalizing and externalizing problems, IQ.

Significant confounders after Bonferroni correction: Antisocial behaviour =single mothers, male gender. Criminal involvement = more conduct problems, male gender. Alcohol use = higher IQ. Illicit drug use = higher IQ, single mothers, domestic violence and maltreatment present. Nicotine dependence = none. Cannabis use = male gender.

7.3.4 Sibling Bullying Roles and High-Risk Behaviour

Examining children according to the roles they assumed in sibling bullying (Table 7.3) revealed that bullies were at increased risk of reporting antisocial behaviour (OR=1.94; 95% CI, 1.52-2.47), criminal involvement (OR=1.66; 95% CI, 1.15-2.40) and illicit drug use (OR=1.45; 95% CI, 1.12-1.87). Bully-victims, on the other hand, were only at increased odds of antisocial behaviour (OR=1.44; 95% CI, 1.18-1.76), while victims were no more likely to report any high-risk behaviour than those uninvolved. Once confounders were included and analyses were rerun using the imputed dataset, results remained significant only in the domain of antisocial behaviour. Bullies (OR=1.66, 95% CI, 1.29-2.13) and bully-victims (OR=1.42, 95% CI, 1.15-1.76) had higher odds of being engaged in antisocial behaviour in early adulthood.

Table 7.3

Odds Ratios for High-Risk Behaviour at 18 or 20 Years According to Sibling Bullying Status at 12 Years

Outcome OR (95% CI)	Sibling Bullying Status			
	Uninvolved	Victim	Bully	Bully-Victim
Antisocial Behaviour				
(N=4,322)	639/2,578 (24.8)	160/534 (30.0)	147/445 (33.0)	163.436 (37.4)
Unadjusted	Reference	1.00 (0.79-1.26)	**1.94 (1.52-2.47)**	**1.44 (1.18-1.76)**
Imputed Adjusted	Reference	0.99 (0.78-1.26)	**1.66 (1.29-2.13)**	**1.42 (1.15-1.76)**
Criminal Involvement				
(N=2,998)	232/1,803 (12.9)	55/281 (14.4)	55/311 (17.7)	53/295 (18.0)
Unadjusted	Reference	0.77 (0.53-1.13)	**1.66 (1.15-2.40)**	1.23 (0.90-1.68)
Imputed Adjusted	Reference	0.77 (0.52-1.14)	1.34 (0.91-1.98)	1.17 (0.84-1.64)
Alcohol Use				
(N=4,152)	1,359/2,477 (54.9)	296/506 (58.5)	262/436 (60.1)	261/425 (61.4)
Unadjusted	Reference	1.04 (0.84-1.29)	1.22 (0.95-1.56)	1.24 (1.02-1.51)
Imputed Adjusted	Reference	1.07 (0.86-1.32)	1.20 (0.94-1.55)	1.28 (1.04-1.57)

Table 7.3

Odds Ratios for High-Risk Behaviour at 18 or 20 Years According to Sibling Bullying Status at 12 Years

Outcome OR (95% CI)	Outcome OR (95% CI)			
	Uninvolved	Victim	Bully	Bully-Victim
Illicit Drug Use				
(N=4,290)	635/2,559 (24.8)	143/531 (26.9)	29/442 (29.2)	132/431 (30.6)
Unadjusted	Reference	1.11 (0.88-1.40)	**1.45 (1.12-1.87)**	1.31 (1.07-1.62)
Imputed Adjusted	Reference	1.08 (0.85-1.37)	1.36 (1.04-1.77)	1.25 (1.01-1.55)
Nicotine Dependence				
(N=3,441)	34/2,028 (1.7)	14/432 (3.2)	8/361 (2.2)	11/345 (3.2)
Unadjusted	Reference	1.45 (0.71-2.99)	1.33 (0.56-3.13)	1.89 (1.03-3.47)
Imputed Adjusted	Reference	1.21 (0.58-2.55)	1.22 (0.50-2.95)	1.51 (0.80-2.86)
Cannabis Use				
(N=2,018)	54/1.132 (4.8)	15/256 (5.9)	10/236 (4.2)	14/212 (6.6)
Unadjusted	Reference	0.49 (0.19-1.22)	1.07 (0.53-2.19)	1.57 (0.93-2.64)
Imputed Adjusted	Reference	0.49 (0.19-1.23)	0.88 (0.42-1.82)	1.48 (0.86-2.57)

OR = Odds ratio. CI = Confidence intervals. Confounders included in imputed adjusted model: gender, maternal education, marital status, maternal depression, domestic violence, maltreatment, peer bullying, child psychiatric problems, internalizing and externalizing problems, IQ. Significant confounders after Bonferroni correction: Antisocial behaviour = male gender, single mothers. Criminal involvement = more conduct problems, lower maternal education, single mothers, male gender. Alcohol use = higher IQ. Illicit drug use = higher IQ, more maternal depression, single mothers, domestic violence and maltreatment present. Nicotine dependence = lower IQ, less internalizing problems, more externalizing problems. Cannabis = male gender, single mothers.

What Kinds of High-Risk Behaviour are Sibling Bullying Perpetrators Involved in?

Bully-victims were more often involved in taking/driving a vehicle without permission and hurting/injuring animals on purpose. Adolescents who were bullies or bully-victims were further at particular risk of being rowdy/rude in public, hitting, or punching someone with the intention of hurting them, deliberately damaging/destroying property, or carrying a knife/weapon for protection. More details can be found in the appendix (Appendix K). In terms of criminal involvement, pure bullies were more likely to get in trouble with the police and regarding illicit drug use they had higher odds of taking cocaine at 18 years (Appendix K).

Birth-Order effects

Post-hoc analysis of birth-order effects (first-born vs. later-born) revealed that children who are sibling bullies were at increased risk of high-risk behaviour only if they were also first-born. Crude associations (Appendix L) found that first-born children who are bullies, were more likely to report antisocial behaviour (OR=1.97; 95% CI, 1.41-2.73), criminal involvement (OR=1.99, 95% CI, 1.24-3.19) and illicit drug use (OR=1.68, 95% CI, 1.18-2.38).

7.3.5 Cumulative Effects of Sibling and/or Peer Perpetration

Sibling and peer bullying were found to be significantly associated. Particularly those children who were perpetrators in one context (i.e. home) were also more likely to be a perpetrator in the other (i.e. school) (Table 7.4). Children who were bullies at home and at school were further found to have three-fold odds of engaging in antisocial behaviour (Table 7.5; OR=3.05; 95% CI, 2.09-4.44). Furthermore, these children were also twice as likely to report criminal involvement (OR=2.12; 95% CI, 1.23-3.66) and illicit drug use (OR=2.11; 95% CI, 1.44-3.08). A linear trend was identified for antisocial behaviour (OR=1.61; 1.41-1.84), criminal involvement (OR=1.33; 95% CI, 1.09-1.63), alcohol use (OR=1.24; 95% CI, 1.08-1.42) and illicit drug use (OR=1.48; 95% CI, 1.29-1.69) suggesting that involvement in multiple perpetration (at home and school) may result in a higher likelihood for high-risk behaviour in early adulthood as opposed to being involved in bullying behaviour in a single context.

When using the imputed dataset and accounting for confounds, the results were attenuated, although bullying perpetration across the home and school context remained a significant predictor of antisocial behaviour and illicit drug use (Table 7.5; imputed adjusted models). Linear trend association was also maintained for antisocial behaviour, alcohol use and illicit drug use.

Table 7.4

Odds Ratios of Associations Between Sibling and Peer Bullying at 12 Years

OR (95% CI)	**Peer Bullying**		
	Pure Victim	Pure Bully	Bully-Victim
Sibling Bullying			
Neutral	1	1	1
Pure Victim	**1.33 (1.04-1.71)***	1.42 (0.79-2.53)	1.28 (0.84-1.97)
Pure Bully	**1.42 (1.06-1.90)***	**2.74 (1.62-4.66)****	**3.42 (2.40-4.87)****
Bully-Victim	**1.86 (1.49-2.33)****	**2.50 (1.56-4.00)****	**4.17 (3.13-5.56)****

OR = Odds ratio. CI = Confidence intervals.

Reference group: Neutral peer bullying status.

*p<0.05 **p<.01.

What Kind of High-Risk Behaviour are Adolescents Involved in When They act as Both Sibling and Peer Perpetrators?

Adolescents who were perpetrators in both the home and school context were more likely to be rowdy/rude in public, hit, kick or punch someone with the intention of hurting them, deliberately damage/destroy property, carry a knife/weapon for protection and use a cheque book/credit card/cash which was stolen (Appendix M). Adolescents involved in both sibling and peer perpetration were furthermore often in trouble with the police, were in trial in court, and took part in a mediation process (Appendix M). Finally, this group of adolescents was also most likely to have tried/taken cocaine at 18 years (Appendix M).

Table 7.5

Odds Ratio for High-Risk Behaviour at 18 or 20 Years According to Sibling and/or Peer Bullying Perpetration at 12 Years

Outcome OR (95% CI)	**Sibling and/or Peer Perpetration**			
	Uninvolved	Either	Both	Linear Trend
Antisocial Behaviour (N=3.583)				
Unadjusted	Reference	**1.50 (1.26-1.79)**	**3.05 (2.09-4.44)**	**1.61 (1.41-1.84)**
Imputed Adjusted	Reference	**1.43 (1.19-1.71)**	**2.75 (1.86-4.07)**	**1.53 (1.33-1.76)**
Criminal Involvement (N=2,713)				
Unadjusted	Reference	1.24 (0.95-1.61)	**2.12 (1.23-3.66)**	**1.33 (1.09-1.63)**
Imputed Adjusted	Reference	1.10 (0.84-1.45)	2.03 (1.13-3.62)	1.24 (1.00-1.53)
Alcohol Use (N=3,453)				
Unadjusted	Reference	**1.26 (1.06-1.50)**	1.45 (0.97-2.15)	**1.24 (1.08-1.42)**
Imputed Adjusted	Reference	**1.30 (1.09-1.54)**	1.40 (0.93-2.09)	**1.25 (1.09-1.02)**
Illicit Drug Use (3,570)				
Unadjusted	Reference	**1.49 (1.25-1.78)**	**2.11 (1.44-3.08)**	**1.48 (1.29-1.69)**
Imputed Adjusted	Reference	**1.49 (1.24-1.79)**	**1.81 (1.22-2.69)**	**1.42 (1.23-1.64)**

Table 7.5

Odds Ratio for High-Risk Behaviour at 18 or 20 Years According to Sibling and/or Peer Bullying Perpetration at 12 Years

Outcome OR (95% CI)	**Sibling and/or Peer Perpetration**			
	Uninvolved	Either	Both	Linear Trend
Nicotine Dependence (N=2,808)				
Unadjusted	Reference	1.40 (0.78-2.50)	1.11 (0.27-4.66)	1.24 (0.78-1.95)
Imputed Adjusted	Reference	1.21 (0.66-2.19)	0.90 (0.20-3.98)	1.09 (0.68-1.76)
Cannabis Use (N=1,707)				
Unadjusted	Reference	1.45 (0.89-2.35)	2.09 (0.87-5.05)	1.45 (1.02-2.06)
Imputed Adjusted	Reference	1.29 (0.78-2.12)	1.78 (0.71-4.47)	1.31 (0.91-1.90)

OR = Odds ratio. CI = Confidence intervals. Bold = p<.0083 (Bonferroni Correction).

Confounders included in imputed analysis: gender, maternal education, marital status, maternal depression, domestic violence, maltreatment, child psychiatric problems, internalizing and externalizing problems, IQ. Significant confounders after Bonferroni correction: Antisocial behaviour = single mothers, male gender. Criminal involvement = more conduct problems, single mothers, male gender. Alcohol use = high IQ. Illicit drugs = high IQ, single mothers, domestic violence and maltreatment present. Nicotine dependence = none. Cannabis = single mothers, male gender.

7.4. Discussion

This study found that sibling bullying perpetration was associated with the development of antisocial behaviour and illicit drug use in a dose-response fashion, while sibling bullying victimisation was found to increase the risk of nicotine dependence. Categorical analysis revealed that bullies were at increased risk of criminal involvement and illicit drug use, while both bullies and bully-victims were at higher odds of reporting antisocial behaviour, even after accounting for peer and parental influences. Finally, a cumulative relationship was identified for perpetrating bullying at home and at school, with those acting as perpetrators across both contexts at the highest risk of antisocial behaviour, criminal involvement and illicit drug use.

A range of previous longitudinal studies on sibling aggression or conflict have consistently found a relationship with poor adjustment including antisocial behaviour and substance use (Bank et al., 2004; Buist, 2010; Natsuaki et al., 2013; Snyder & Burraston, 2005; Solmeyer et al., 2014; Tucker et al., 2015). Our study extends these findings by looking beyond the general construct of sibling conflict and instead examined differential outcomes depending on the frequency of sibling bullying perpetration and victimisation as well as sibling bullying roles assumed by children (uninvolved, victim, bully, bully-victim).

According to SLT and coercion theory we predicted that sibling bullying perpetration would be most strongly associated with high-risk behaviour. Our findings support this hypothesis, particularly in the domain of antisocial behaviour, which is in line with previous longitudinal studies on perpetrating sibling aggression (Natsuaki et al., 2009; Tucker et al., 2015) and peer bullying (Bender & Lösel, 2011; Farrington et al., 2011; Ttofi et al., 2011; Ttofi et al., 2012). While sibling bullying perpetration did not remain a significant predictor across other forms of high-risk behaviour, once confounds were accounted for, a linear trend was identified for criminal involvement, alcohol use and illicit drug use, suggestive of a dose-response relationship. This is supported by studies on peer bullying which found similar dose-response associations between bullying perpetration and antisocial behaviour, violence, criminality and substance use (Klomek et al., 2015). On the contrary, adolescents who were victimised by a sibling were found to be at increased risk for nicotine dependence, but only if the bullying

occurred several times a week. This has not yet been studied, however the findings for peer victimisation and smoking are consistent with this finding (Moore et al., 2017). GST may serve as a framework for explaining this association. According to GST environmental strain produces negative emotions which may trigger engagement in corrective behaviour (Agnew, 1992). Our results are consistent with GST by suggesting sibling bullying victimisation as an additional specific strain that may result in compensatory behaviour (nicotine dependence) in order to alleviate the stress of sibling bullying (Agnew, 2001). We further predicted that those who acted as sibling bullies or bully-victims would most likely be involved in high-risk behaviour. This was confirmed for antisocial behaviour, as previously shown with peer perpetration (Klomek et al., 2015). These findings support SLT and coercion theory, according to which aggression is learned via observation/experience and reinforcement (Bandura, 1977). Children who lack parental guidance and grow up in households where aggressive behaviour between brothers and sisters is permitted will learn that aggression may be a useful resource towards reaching a desired outcome (i.e. ownership of a toy). In turn, these children are likely to internalize this interactional style and continue to resort to maladaptive behaviour in future contexts. Along those lines, this study shows that adolescents who are involved in frequent sibling bullying perpetration at home, either as a bully or bully-victims, are at increased odds of engaging in antisocial behaviour beyond the family environment.

A discrepancy to the peer literature was evident in the domains of criminal involvement and substance use. Peer bullies are frequently found to be at risk for substance use (Durand et al., 2013; Moore, Norman, Sly, Whitehouse, Zubrick, & Scott, 2014; Durand, 2017) and both peer bullies and bully-victims have been reported to be at significantly higher odds of criminal involvement (Klomek et al., 2015). Our study only found evidence of an association between sibling bullies and antisocial behaviour, criminal involvement and illicit drug use, particularly when children were also first-born. However, this link was no longer significant once confounds were allowed for.

Our final hypothesis was that involvement as a bullying perpetrator across both the sibling and peer context would yield the highest odds of high-risk behaviour in early adulthood, as suggested by coercion theory. This prediction was confirmed for

antisocial behaviour, criminal involvement and illicit drug use, where adolescents had 2-3 times the odds of being involved with any of the three outcomes. This extends previous findings which have shown that sibling and peer bullying have cumulative adverse effects on problem behaviour (Wolke & Skew, 2012) and allows for similar conclusions to be made for high-risk behaviour. Moreover, our findings suggest a synergistic effect of sibling and peer bullying perpetration on high-risk behaviour. This would have important implications for intervention and prevention strategies. As shown in our findings, involvement in bullying perpetration across multiple contexts may exacerbate high-risk behaviour outcomes and thereby strengthen an already underlying antisocial tendency (Farrginton & Ttfofi, 2011). Our findings support SLT (Bandura, 1977), and in particular coercion theory (Patterson et al., 1982) illustrating how repeated intentional harm-doing within the family context (sibling bullying) may provide a training ground and an internalized aggressive interpersonal model encouraging similar behaviour patterns outside the family environment (peer bullying), in turn increasing the likelihood of following an antisocial trajectory later in life (Solmeyer et al., 2014).

This and other recent evidence on the negative consequences of sibling bullying (Bowes et al., 2014; Tucker et al., 2013) have implications for helping parents to deal with sibling aggression. Parents who do not intervene in their offspring's repeated aggressive exchanges or are inconsistent in intervening, allow the perpetrators to learn that they can get away with aggressive interpersonal behaviour that then generalises across other contexts (Ensor et al., 2010; Wolke & Samara, 2004; Tanrikulu & Campbell, 2015; Tippett & Wolke, 2015; Tucker et al., 2014b). Preventative measures in the form of parental education should be offered to help parents improve sibling relationship quality (Pickering & Sanders, 2015). Health professionals should ask about sibling bullying and monitor children's early aggressive tendencies, as these may be an early warning sign or predictor of long-term problems (Song et al., 2016). Moreover, there is a need for researchers to develop and evaluate interventions that are specifically aimed at altering and improving the sibling relationship quality of children involved in sibling bullying to reduce high-risk behaviour later in life.

7.4.1. Strengths and Limitations

Our study has several strengths. First, to our knowledge this is the first long-term longitudinal prospective birth cohort study that has explored the relationship between sibling bullying and high-risk behaviour. This has allowed us to make predictions up to 8 years after sibling bullying was assessed. Using a large longitudinal dataset has further allowed us to account for a range of pre-existing childhood risk factors of our outcome (e.g. maltreatment, domestic violence, conduct disorder), thereby increasing confidence in a predictive relationship between sibling bullying and high-risk behaviour. Second, this study separately explored the influence of sibling bullying perpetration and victimisation on high-risk behaviour outcomes. This has allowed us to make differential conclusions based on the roles assumed between sibling bullying. Third, we explored the cumulative relationship of bullying perpetration across the home and school context and high-risk behaviour outcomes, enabling us to identify multiple risk-factors that may synergistically predict high-risk antisocial behaviour trajectories. Finally, we applied Bonferroni correction (Armstrong, 2014) to all of our analysis, providing conservative estimates of associations.

There were also limitations to our study. Large longitudinal population studies are prone to subject loss. We addressed this by applying multiple imputation analysis in order to account for missing values. However, the outcome variables criminal involvement, nicotine dependence and cannabis use had much lower response rates than all other outcome variables, although they were still in their thousands. This reduces statistical power and could for instance be one possible explanation for why sibling bullying perpetration may not be as strongly associated with criminal involvement as expected from peer bullying studies (Farrington et al. 2011; Ttofi et al., 2011; Ttofi et al., 2012). Finally, although early externalizing and internalizing problems and diagnoses were included as confounds, we cannot exclude the possibility of reverse causality as we did not have measures of our outcome variables prior to the time point where sibling bullying was measured. However, antisocial behaviour has been reported to show a marked increase and peak in prevalence during adolescence (Moffitt & Caspi, 2001). Hence, only a small proportion of children would have been expected to display antisocial behaviour beyond externalizing problems and conduct disorder during early childhood, which this study accounted for.

7.4.2. Conclusion

Children who are involved as perpetrators in sibling bullying are more likely to show antisocial behaviour in early adulthood. The association between perpetration and antisocial behaviour is strongest when children bully their sibling every week or day and, in particular, when they are also involved in bullying peers. Thus, sibling bullying perpetration is not a normal rite of passage but provides an early warning for later antisocial behaviour. Sibling bullying may be a marker of the trajectory to antisocial behaviour problems or even a causative factor in the development of antisocial behaviour. Intervention studies (Natsuaki et al., 2009; Tucker et al., 2015) are needed to determine whether changes in sibling bullying are related to improved long-term social and behaviour outcomes.

CHAPTER EIGHT: Sibling Bullying in Middle Childhood and Psychotic Disorder at 18 Years: A Prospective Cohort Study

Background: *Being bullied by a sibling has been recently identified as a potential risk factor for developing depression and self-harm. It is unknown whether this risk extends to other serious mental health problems such as psychosis. We investigated whether sibling bullying victimisation or perpetration in middle childhood was prospectively associated with psychotic disorder in early adulthood.*

Methods: *The current study investigated 6,988 participants of the Avon Longitudinal Study of Parents and Children, a UK community-based birth cohort. Sibling bullying was reported at 12 years and psychotic disorder was assessed via a semi-structured interview at 18 years.*

Results: *Involvement in sibling bullying was associated with psychotic disorder in a dose-response fashion, even after controlling for a range of confounders. Those involved several times a week were 2-3 times more likely to meet criteria for a psychotic disorder (odds ratio [OR]; 95% confidence interval [CI]): victimisation (OR=2.74; CI=1.28-5.87); perpetration (OR=3.16; CI=1.35-7.41). Categorical analysis indicated that particularly victims (OR=3.10; CI=1.48-6.50) and bully-victims (OR=2.66; CI=1.24-5.69) were at increased risk of psychotic disorder. Involvement in both sibling and peer bullying had a dose-effect relationship with psychotic disorder, with those victimised in both contexts having more than four times the odds for psychotic disorder (OR=4.57; CI=1.73-12.07).*

Conclusion: *Parents and health professionals should be aware of the adverse long-term effects of sibling bullying.*

Dantchev, S., Zammit, S., & Wolke, D. (2018). Sibling bullying in middle childhood and psychotic disorder at 18 years: A prospective cohort study. Psychological Medicine, 8, 2321-2328. doi: 10.1017/S0033291717003841

8.1 Introduction

There is a paucity of prospective studies considering sibling aggression as a precursor of the development of mental health problems. This is surprising, considering that sibling aggression is the most common form of family violence (Finkelhor et al., 2006; Radford et al., 2013). Nevertheless, parents and health professionals continue to perceive aggression between siblings as benign and normative behaviour that children will outgrow (Eriksen & Jensen, 2009). While occasional conflict between siblings can be constructive, repeated negative interactions may have detrimental outcomes such as increasing the risk of internalizing and externalizing problems (Buist et al., 2013).

Repeated aggressive behaviour perpetrated by a sibling, with the intention to cause harm and involving an element of perceived or real power imbalance has been labelled as sibling bullying (Wolke et al., 2015). Sibling bullying has been associated with adjustment problems such as increased emotional and behavioural problems, as well as greater mental health distress (Wolke & Samara, 2004; Wolke & Skew, 2009; Tucker et al., 2013b; Tucker et al., 2014a). However, these findings have been based on cross-sectional or retrospective designs, preventing conclusions to be drawn on whether emotional or behaviour problems preceded sibling bullying, or vice versa.

At present, we are only aware of one study that prospectively studied the relationship between experiencing sibling bullying in middle childhood and mental health in late adolescence/early adulthood. This recent study (Bowes et al., 2014) reported that experiencing sibling bullying several times a week in middle childhood increased the odds of depression and self-harm twofold, even after controlling for peer bullying, other confounders and pre-existing emotional problems.

There is now ample evidence that childhood trauma such as physical or sexual abuse increases the odds of reporting psychotic symptoms (Varese et al., 2012) as well as developing psychotic disorders (Bebbington et al., 2004; Fisher et al., 2010; Varese et al., 2012). Psychotic disorders are one of the most impairing mental health problems with severe effects on individual's quality of life and significant social and economic costs (Kennedy, Altar, Taylor, Degitiar, & Hornberger, 2014).

Recent research has indicated that bullying, the systematic abuse by peers, is also implicated in the development of both psychotic symptoms (Cunningham et al., 2016) and psychotic disorders (Bebbington et al., 2004; Sourander et al., 2016; Trotta et al., 2013). While most research has focused on childhood victimisation, some evidence suggests that perpetrating peer bullying may also be associated with increased psychotic symptoms (Kelleher, Harley, Lynch, Arseneault, Fitzpatrick, & Cannon, 2008). However, it is unclear whether this is related to bullying perpetration per se, or the subset of children involved as both perpetrators and victims of bullying. Moreover, sibling aggression has been associated with the involvement in peer bullying (Tucker et al., 2014a; Tippett & Wolke, 2015) and involvement in both bullying at home and at school has been found to have a dose-effect relationship on experiencing mental health distress, emotional and behavioural problems (Wolke & Samara, 2004; Wolke & Skew, 2012; Tucker et al., 2014a). Whether this dose-effect relationship translates onto the development of psychotic disorders is unknown. As far as we are aware, there are no previous prospective studies of bullying victimisation or perpetration between siblings and the risk of developing a psychotic disorder by early adulthood.

The aim of the present study was to investigate the association between sibling bullying in middle childhood and psychotic disorder in early adulthood. We investigated whether (1) there is an association between experiencing sibling bullying (victimisation or perpetration) at 12 years and the development of psychotic disorder by 18 years; (2) whether there is a dose-response relationship between the frequency of experiencing sibling victimisation or perpetration and psychotic disorder; (3) whether the role taken in sibling bullying (victim, bully, bully-victim) is differentially associated with psychotic disorder and (4) whether being victimised in more than one context (siblings at home and peers at school) is cumulatively associated with psychotic disorder.

We expected to find an association between sibling bullying victimisation and psychotic disorder (Arseneault et al., 2011; Schreier et al., 2009,Wolke et al., 2014) with those children acting as bully-victims being at the highest risk for a psychotic disorder (Sourander et al., 2016; Wolke et al., 2014). We further anticipated to see a dose-response effect for sibling and peer victimisation, where victimisation across

both contexts is associated with higher risk of psychotic disorder (Wolke & Skew, 2012; Tucker et al., 2014).

8.2 Methods

8.2.1 Study Design

The Avon Longitudinal Study of Parents and Children (ALSPAC) is a birth cohort study that recruited 14,541 pregnant women from Avon, UK with an expected delivery date between 1st April 1991 and 31st December 1992. Out of this initial number of pregnancies, where enrolled mothers had either returned at least one questionnaire or attended one "Children in Focus" clinic by the 19th June 1999, there were 14,062 live births with 13,988 of these children still alive at the age of 12 months. A detailed report on the recruitment process of the mother and child cohorts are available in the cohort profile (Boyd et al., 2013; Fraser et al., 2013). Children were invited to attend annual assessment clinics, including face-to-face interviews, and psychological and physical tests from 7 years onwards. Please note that the study website contains details of all the data that is available through a fully searchable data dictionary at http://www.bris.ac.uk/alspac/researchers/data-access/data-dictionary/. Ethical approval for the study was obtained from the ALSPAC Ethics and Law Committee and the Local Research Ethics Committees.

8.2.2 Sample

Our starting sample includes 6,988 children who completed detailed questions on sibling bullying at the 12-year assessment. Questionnaires were sent out to 11,132 eligible participants, of which 7,505 (67.4%) were returned and completed. Children with no siblings (*N*=477) were excluded. Semi-structured interviews measuring psychotic experiences at 18 years were available for 4,718 adolescents. Our complete sample consists of 3,596 participants where data were available across both exposure and outcome variables (see Figure 8.1).

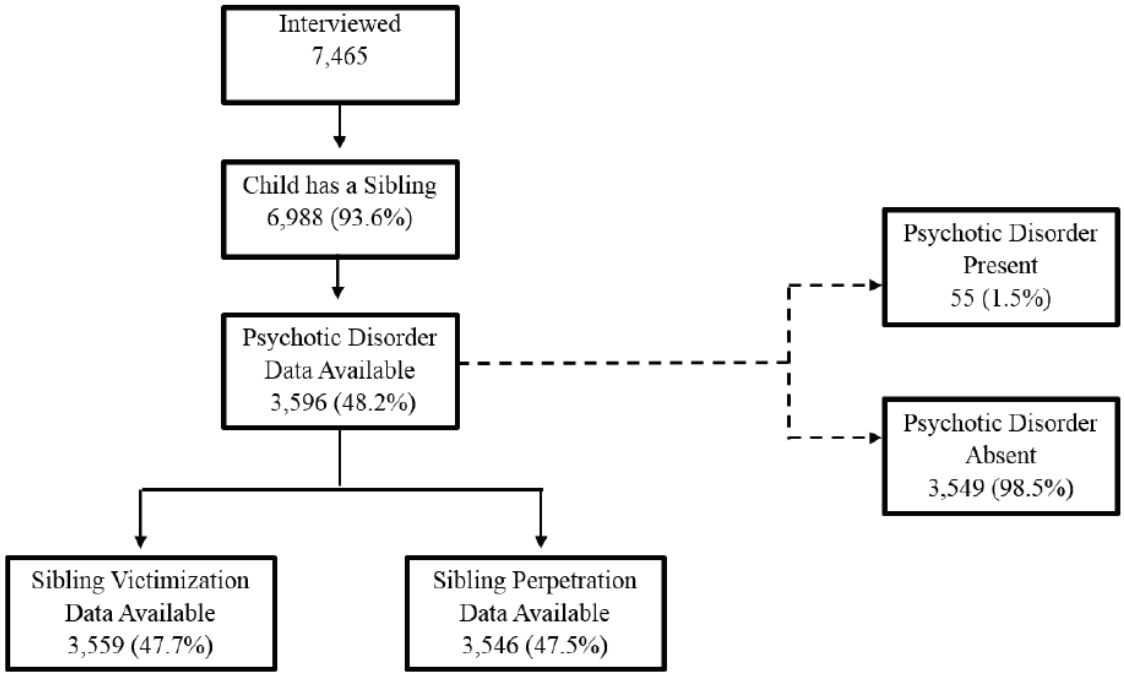

Figure 8.1

Flowchart of Participants Assessed at 12 Years on Sibling Bullying and Subsequent Assessment of Psychotic Disorder

8.2.3 Assessment of Sibling Bullying

Sibling bullying was assessed at 12 years via a standard sibling bullying questionnaire adapted from the Olweus Bullying Questionnaire (Olweus, 2007). Children were informed that they would be asked about bullying by brothers and sisters, explaining that this is when a sibling tries to upset them "by saying nasty and hurtful things, or completely ignores [them] from their group of friends, hits, kicks, pushes or shoves [them] around, tells lies or makes up false rumours about [them]". Children were asked whether they were ever bullied (victimisation) or had ever bullied (perpetration) their brother or sister in the past 6 months. Responses were on a Likert scale: "never", "only ever once or twice", "2 or 3 times a month", "about once a week" and "several times a week".

We used sibling bullying as an ordinal (frequencies of victimisation and perpetration, respectively) and categorical variable (victim, bully, bully-victim). Children reporting victimisation several times a month or every week were classified as victims, children reporting perpetration several times a month or every week were classified as bullies. Those who were victimised, but also bullied a sibling several times a month or every week were "bully-victims". Children who neither bullied or were victimised several times a month or several times a week were classified as "non-involved" (Wolke et al., 2014).

8.2.4 Psychotic Disorder in Early Adulthood

Psychotic disorder was assessed via the semi-structured face-to-face Psychosis-like Symptoms Interview (PLIKSi) at a mean age of 17.5 years. The PLIKSi has been adapted from the standardized clinical examination developed for the Schedule for Clinical Assessment in Neuropsychiatry (WHO, 1994). Following a brief section addressing unusual experiences, 11 core questions eliciting key psychotic experiences since the age of 12 were asked by trained Psychology graduates who administered the PLIKSi. Key psychotic experiences from the PLIKSi fell into categories of hallucinations (visual and auditory), delusions (e.g. being spied on) and experiences of thought interference (e.g. broadcasting). Inter-rater reliability as well as test-retest reliability of the PLIKSi were found to be high (kappa=0.83 and 0.76; Zammit et al., 2013). Individuals were classified as having a psychotic disorder if they fulfilled DSM-IV and ICD 10 criteria and reported definite psychotic experiences not attributable to the effects of sleep or fever occurring at least once per month over the previous 6 months and either caused distress, negative impact on daily functioning or led to help seeking (Zammit et al., 2013).

8.2.5 Potential Confounders

We selected potential confounders a priori based on the literature on peer bullying and mental health and those identified by Bowes et al. (2014) for sibling bullying. Confounders were assessed before the mean onset age of sibling bullying, occurring at or before the age of 8 years.

Individual Characteristics

Previous psychiatric diagnoses were assessed using the Development and Wellbeing Assessment (Goodman et al., 2000) based on parent and teacher reports when children were 7 years. Children were classified as presenting no DSM-IV Axis I diagnosis (*N*=7775, 94.2%) or presenting one or more Axis I diagnoses of attention deficit hyperactivity disorder, conduct disorder, oppositional defiant disorder, depression or anxiety (Schreier et al., 2009).

Internalizing and externalizing problems were assessed via the Strengths and Difficulties Questionnaire (Goodman, 2001) via the emotional symptoms and conduct problems subscales (α=.70 across both subscales), based on maternal reports when the study child was 7 years.

Peer bullying was assessed using a modified version of the Bullying and Friendship Interview Schedule (internal consistency α=.77; Wolke, Woods, Bloomfield, & Karstadt, 2001) when children were 8 and 12 years. The interview asked children about peer bullying victimisation and perpetration. Children were considered as peer victims or bullies if they reported any overt or relational peer bullying several times a month or several times a week.

The UK version of the Wechsler Intelligence Scale for Children – III (Wechsler et al.,1992) was administered at the 8-year clinic to establish an overall score for children's intelligence quotient (grand mean=103.97; SD=16.54).

Family Characteristics

Maternal depression was assessed during pregnancy at 18 weeks' gestation via the Edinburgh Post-Natal Depression Scale (Cox et al., 1987). Maternal reports further provided information about the study child's birth order (first born or later born), number of other children in the household ($\leq$2 or $\geq$3), sibling gender (older brother/sister or not), maternal education (certificate of secondary school education and lower or ordinary-level education and higher) and marital status (single or married) when children were between 7 and 8 years old (Bowes et al., 2014). Domestic violence was measured across four time points when children were between 8 months

and 4 years and was considered as present if mothers reported any physical or emotional cruelty from their partner at any time point (Bowes et al., 2014). Maltreatment was measured across seven time points when children were between 1 and 8 years and was considered present if mothers reported any physical or sexual abuse at any time point.

8.3 Statistical Analysis

All analyses were conducted using SPSS 23 and STATA 14. Firstly, we determined the distribution of exposure to sibling bullying behaviour across gender. We used Mann Whitney U tests and X^2 analysis to test whether gender was separately associated with bullying victimisation, perpetration or sibling bullying status. Secondly, we assessed the distribution of sibling bullying behaviour across all confounding variables. Mann Whitney U tests and one-way ANOVA analyses were performed to test for individual and family characteristics of children who were victims or perpetrators of sibling bullying (Appendix N). Binary logistic regression analysis was utilized to examine selective drop-out, by comparing adolescents with interviews about sibling bullying who had completed the PLIKSi at 18 with those who were lost to follow-up (Appendix O).

To assess associations between involvement in sibling bullying in middle childhood and psychotic disorder in late adolescence, a set of logistic regression models were run. First, victimisation and perpetration were used as ordinal variables in order to identify a dose-response relationship. Unadjusted analyses indicate the crude relationship between victimisation and perpetration with psychotic disorder. Odd ratios (OR) and 95% confidence intervals (CI) are reported.

We then tested whether the role taken in sibling bullying was related to psychotic disorder. Again we ran logistic regression analyses, however this time sibling bullying was used as a categorical variable (victim, bully, bully-victim).

To test whether there was a dose-response effect of sibling and peer victimisation at 12 years, we performed binary logistic regression analysis, where sibling and/or peer victimisation was treated as a continuous variable (non-involved, victimised by siblings *or* peers, victimised by siblings *and* peers).

8.4 Missing Data

To address possible bias in our findings, resulting from missing data by attrition, we used fully conditional specification equations as implemented in the Multiple Imputation by Chained Equations algorithm in STATA 14. We included a range of early sociodemographic variables into our model, given that these have been associated with missingness in ALSPAC. Our imputed adjusted models included a range of confounders consisting of family characteristics as well as factors that have previously been associated with psychosis (as outlined above). Using averaged parameter estimates over 60 imputed datasets using Rubin's rules (Little & Rubin, 2002) we were able to impute up to starting sample of 3,559.

8.5 Results

8.5.1 Prevalence and Characteristics of Sibling Bullying Involvement

Children reported the onset of sibling bullying victimisation (*M*=8.3, *SD*=2.51) and perpetration (*M*=8.7, *SD*=2.38) in years around the same time. Girls were more often victimised by a sibling compared to boys, while no gender difference was found for sibling bullying perpetration. Out of all children, 771 were bully-victims, 664 were pure victims and 486 were pure bullies, making up the smallest group. No gender difference was identified between bully status groups.

Children that were victimised had lower IQ, more internalizing and externalizing problems and were more frequently bullied by peers at 8 years. Moreover, they were more often later born, had more siblings and older brothers. Mothers of victimised children had higher depression scores in pregnancy, were more often exposed to domestic violence and the children to maltreatment. Children who were perpetrators of sibling bullying had lower IQ scores and higher internalizing and externalizing problems previously. Perpetrators were more often first-born and came from families with mothers with higher depression scores in pregnancy, more siblings in the household and were less likely to have older sisters. Experience of maltreatment and domestic violence in the family were more frequent in those children who were

perpetrators. For more details on individual and family characteristics of sibling bullying victims and perpetrators see Appendix N.

8.5.2 Dropout Analysis

Using the 12-year sibling bullying assessment as our starting point (*N*=6988), our dropout analysis (Appendix O) revealed that participants were less likely to have completed the PLIKSi follow-up at 18 years if they were male, had lower IQ scores, more externalizing problems in childhood and if they had bullied a sibling several times a week. Later born children, those from families where mothers were single, had higher depression scores in pregnancy, lower levels of education or reported domestic violence were also more likely to have been lost to follow-up.

8.5.3 Associations Between Sibling Bullying and Psychotic Disorder

Out of the 3,596 participants who completed both the sibling bullying assessment as well as the PLIKSi at 18 years, a total of 55 (1.5%) adolescents were classified with a psychotic disorder. The rates of psychotic disorder for those involved in sibling bullying was 11 (3%) pure victims, 6 (2.5%) pure bullies and 11 (2.9%) bully-victims.

8.5.4 Sibling Victimisation

Children who reported being victimised by a sibling several times a week had nearly three times the odds of meeting criteria for a psychotic disorder at 18 years (Table 8.1; OR = 2.92; 95% CI, 1.41-6.02). Evidence of a linear association was identified after victimisation was treated as a continuous term, indicating a dose-response relationship of being victimised by a sibling and psychotic disorder (Table 8.1).

8.5.5 Sibling Perpetration

Children who reported bullying a sibling several times a week were found to increase the odds of psychotic disorder three-fold (OR = 3.49; 95% CI, 1.57-7.73). A linear trend was identified, pointing towards a dose-response relationship for bullying a sibling (Table 8.1).

Table 8.1

Prevalence and ORs of Psychotic Disorder at Age 18 According to Sibling Bullying Victimisation and Perpetration at Age 12

Sibling Bullying	Frequency of Sibling Bullying					
	Never	Only Ever Once or Twice	2 or 3 Times a Month	About Once a Week	Several Times a Week	Linear Trend
Victimisation (N=3,559)	1,849	626	333	363	388	
% yes	1.1	1.4	0.9	2.8	3.1	
Unadjusted OR (95% CI)	Reference	1.33 (0.60-2.95)	0.83 (0.25-2.81)	**2.59 (1.20-5.58)***	**2.92 (1.41-6.02)****	**1.31 (1.11-1.56)****
Imputed Adjusted[a] OR (95% CI)	Reference	1.27 (0.57-2.84)	0.81 (0.23-2.80)	**2.37 (1.07-5.28)***	**2.74 (1.28-5.87)****	**1.29 (1.08-1.54)****

[a] Includes family characteristics and factors associated with psychosis as confounders.

Significant confounders: Victimisation=male gender, lower maternal education, single marital status, maltreatment present. Perpetration=male gender, lower maternal education, single marital status, maltreatment present.

*p<.05 **p<.01.

Table 8.1 continued

Prevalence and ORs of Psychotic Disorder at Age 18 According to Sibling Bullying Victimisation and Perpetration at Age 12

Sibling Bullying	Frequency of Sibling Bullying					
	Never	Only Ever Once or Twice	2 or 3 Times a Month	About Once a Week	Several Times a Week	Linear Trend
Perpetration (N=3,546)	2,096	440	384	349	277	
% yes	1.0	1.4	2.6	2.3	3.3	
Unadjusted OR (95% CI)	Reference	1.44 (0.57-3.59)	**2.78 (1.29-5.98)****	**2.44 (1.06-5.57)***	**3.49 (1.57-7.73)****	**1.37 (1.15-1.63)****
Imputed Adjusted[a] OR (95% CI)	Reference	1.35 (0.53-3.44)	**2.71 (1.23-5.95)***	**2.47 (1.00-5.61)***	**3.16 (1.35-7.41)****	**1.35 (1.12-1.62)****

[a] Includes family characteristics and factors associated with psychosis as confounders.

Significant confounders: Victimisation=male gender, lower maternal education, single marital status, maltreatment present. Perpetration=male gender, lower maternal education, single marital status, maltreatment present.

*p<.05 **p<.01.

8.5.6 Sibling Bullying Status Groups

When looking at the role taken in sibling bullying (victim, bully, bully-victim), crude associations indicated that any role taken in sibling bullying is associated with being classified with a psychotic disorder (Table 8.2).

Table 8.2

Prevalence and Odds Ratios of Psychotic Disorder at Age 18 According to Sibling Bullying Status at Age 12

	Sibling Bullying Status			
	Non-Involved	Pure Victim	Pure Bully	Bully-Victim
Bullying Involvement (N=3,522)	2,538	364	236	384
%yes	1.0	3.0	2.5	2.9
Unadjusted OR (95% CI)	Reference	**3.13 (1.53-6.42)****	**2.62 (1.06-6.46)***	**2.96 (1.45-6.07)***
Imputed Adjusted[a] OR (95% CI)	Reference	**3.10 (1.48-6.50)****	**2.68 (1.04-6.89)***	**2.66 (1.24-5.69)***

[a] Includes family characteristics and factors associated with psychosis as confounders. Significant confounders: male gender, lower maternal education, single marital status, maltreatment present.

*p<.05 **p<.01.

8.5.7 Sibling and Peer Victimisation

An overlap was identified across sibling and peer victimisation (Appendix P). Binary logistic regression analysis showed that experiencing either sibling or peer victimisation was associated with an increased risk of meeting the criteria of a psychotic disorder (Table 8.3). Moreover, there was an additional increase in the odds ratio for children who were exposed to victimisation by both siblings and peers (OR=4.72; 95% CI, 1.90-11.72). A linear association was identified when

victimisation at home and/or school was treated as a continuous term, with cumulative victimisation (home and school) being more strongly associated with psychotic disorder.

Table 8.3

Prevalence and Odds Ratios of Psychotic Disorder at Age 18 According to Sibling and/or Peer Victimisation at Age 12

	Non-Involved	Sibling OR Peer	Sibling AND Peer	Linear Trend
Psychotic Disorder (N=3,171)	1,957	1,015	199	
% yes	0.8	2.2	3.5	
Unadjusted OR	Reference	**2.87**	**4.72**	**2.28**
(95% CI)		**(1.48-5.55)****	**(1.90-11.72)****	**(1.51-3.44)****
Imputed Adjusted[a] OR (95% CI)	Reference	**2.66**	**4.57**	**2.23**
		(1.40-5.03)**	**(1.73-12.07)****	**(1.42-3.49)****

[a] Includes family characteristics and factors associated with psychosis as confounders. Significant confounders: lower maternal education, single marital status.

*p<.05 **p<.01.

8.5.8 Missing Data Imputation

After performing the multiple imputation, all of our logistic regression analyses were repeated using the imputed dataset and additionally controlling for a range of confounders including family characteristics and factors previously associated with psychosis (Table 8.1-8.3). All associations between our exposure and outcome variables were only slightly attenuated.

8.5.9 Sensitivity Analysis

We repeated all of our analysis, additionally accounting for concurrent psychotic-like experiences at 12 years in order to account for some reverse causality. Our results were slightly attenuated in strength (Appendix Q – S), however sibling bullying

victimisation and involvement in both sibling and peer victimisation remained strong predictors of psychotic disorder.

8.6 Discussion

This study found that sibling bullying victimisation and perpetration in middle childhood is associated with the development of a psychotic disorder by 18 years in a dose-response fashion. Categorical analysis further indicated that children who act as pure victims and bully-victims several times a month or week, are at a particular risk of being classified with a psychotic disorder by early adulthood, even after imputing for missing data and adjusting for a wide range of confounders. Finally, the findings suggest that children who were victimised in more than one context (home and school) were at the highest odds of meeting criteria of a psychotic disorder.

As this is the first prospective study of sibling bullying and the development of psychotic disorder, findings may be compared to effects found for peer bullying. We found a robust association between sibling bullying victimisation and perpetration with psychotic disorder that remained even after controlling for well-known precursors of psychotic symptoms such as childhood cognitive abilities (Horwood et al., 2008), maltreatment, domestic violence and peer bullying (Kelleher et al., 2008; Varese et al., 2012; Wolke et al., 2014). These results are in line with previous studies who have consistently identified peer victimisation as a risk factor for the development of psychotic experiences and symptoms (Arseneault, Cannon, Fisher, Polanczyk, Moffitt & Caspi, 2011; Schreier et al., 2009; Wolke et al., 2014). They are also comparable to some of the few studies on peer bullying that have suggested perpetration as an additional risk factor for psychotic experiences (Kelleher et al., 2008; Wolke et al., 2014).

Categorical analysis indicated that involvement in any role of sibling bullying was associated with an increased risk of psychotic disorder years later, however the findings were strongest for children who were pure victims or bully-victims, This parallels previous work finding that pure victims and bully-victims amongst peers are at the greatest risk for psychotic experiences (Schreier et al., 2009; Wolke et al., 2014) and psychotic disorders (Sourander et al., 2016) in early adulthood. Sibling bullying

victimisation should thus be considered as an additional risk factor or early marker in the development of psychotic disorder. While pure bullies were also found more likely to meet criteria of a psychotic disorder, the strength of the effect was weaker compared to pure victims and bully-victims. This suggests that it may be the unique combination of being a victim and perpetrator (bully-victim) of sibling bullying rather than a pure bully that increases the odds of a psychotic disorder. Alternatively, it may be due to issues of statistical power: the group of bullies was smaller and thus confidence intervals wider. The findings indicate that all involved in frequent sibling bullying were at increased risk of developing psychotic disorder.

Exploring bullying within the home and school environment further revealed that children exposed to multiple victimisation at the hands of both siblings and peers were at a higher risk of psychotic disorders compared to children who were only victimised in one context. This resonates with other work that has shown a dose-response relationship between experiencing multiple trauma types and psychosis (Shevlin et al., 2008). It also extends findings from previous studies by showing that victimisation by siblings and peers not only increases the risk of clinically significant behaviour problems (Wolke & Skew, 2012), but additionally poses a substantial risk towards the development of severe mental health problems like psychotic disorders.

We may speculate on why those who become victimised by a sibling, either as a pure victim or bully-victim are at increased risk for psychotic experiences years later. Social defeat is proposed as a possible route in explaining the development of schizophrenia (Selten & Cantor-Graae, 2005). Feelings of failed struggle and losing rank have been reported to induce negative self-beliefs and thereby predict psychotic symptoms (Stowkowy & Addinton, 2012). There is evidence showing that social defeat is an important mediator in explaining the relationship between childhood trauma and psychotic experiences, especially in the context of bullying (van Nierop et al., 2014). In peer bullying, bully-victims are found to be the most defeated, seeing that they hold the negative qualities of both pure bullies and victims (Lereya et al., 2015). These children become victimised, despite fighting back and may therefore be at the highest risk of experiencing social defeat and developing dysfunctional schemas. This tallies with our finding that sibling bully-victims had an increased risk for psychotic disorder.

Cognitive theories may also inform our understanding of how sibling bullying may increase the risk of psychotic disorder. Childhood trauma has been argued to create a lasting cognitive vulnerability generating negative schemas about the self and the world (Garety et al., 2001). This form of negative cognitions resulting from traumatic events such as sexual abuse (Kilcommons & Morrison, 2005) or peer bullying (Campbell & Morrison, 2007) have been linked to psychotic experiences, allowing for similar speculations to made for sibling bullying involvement.

Biopsychosocial models (Read et al., 2014) lend further explanation of how childhood adversities may lead to psychotic disorders. Environmental liabilities are thought to sensitize individuals, increasing their reactivity towards minor life stressors (Collip et al., 2013; Myin-Germeys et al., 2005). Especially early life adversities such as childhood trauma, abuse and bullying have been found to elevate stress sensitivity (Lardinois et al., 2011; Knack et al., 2011) in physiological systems such as the hypothalamic-pituitary-adrenal (HPA) axis and the body's dopaminergic system (Holtzman et al., 2013), both which are implicated in psychosis. Inflammatory markers such as increased levels of C-reactive protein (Hepgul et al., 2012) or DNA methylation (Ouellet-Morin et al., 2013) are other examples of biomarkers that have been suggested as mediators between childhood trauma and psychosis. Sibling bullying may therefore be viewed as an additional trigger in altering physiological responses to stress.

Although associations between pure bullies and psychotic disorders were weaker compared to other sibling bullying groups, it is equally important to address possible mechanisms through which perpetration might lead to psychotic disorders. The presence of psychotic symptoms as well as psychotic disorders have consistently been linked to an elevated risk of aggressive behaviour (Hodgins, 2008a). While the aetiological pathways leading to violence in psychotic disorders remain uncertain, childhood deviant behaviour has been suggested as a developmental prodrome of aggression in schizophrenia (Swanson et al., 2008). Cross-sectional and longitudinal studies have found that childhood conduct disorders may account for violent behaviours in adults with schizophrenic disorders (Hodgins et al., 2008b). This evidence taken together with our findings, suggests that displaying aggressive

behaviours in childhood may be treated as a developmental marker of psychotic disorders in an already vulnerable individual with a tendency towards persistent aggressive behavioural patterns. This study adds that sibling bullying perpetration, beyond general conduct problems in childhood, is associated with the development of psychotic experiences.

8.6.1 Strengths and Limitations

There are many strengths of this study. First, we used a longitudinal birth cohort that allows to make time-ordered conclusions about the association between sibling bullying and psychotic disorder. Secondly, we included a large range of potential confounders shown to be associated with sibling bullying and psychotic symptoms. This increases the confidence that the relationship between our exposure and outcome variables is causal. Third, unlike previous work on sibling bullying, focusing solely on victimisation, we also showed a dose-response effect of perpetration of sibling bullying. Fourth, repeating the analysis using an imputed dataset further strengthens the confidence in our findings.

There are also limitations. Large geographically defined population studies are prone to subject loss over a 19-year period. The dropout was selective and related to family variables such as lower levels of maternal education and single-mother households, making our sample more advantaged. Thus, like many longitudinal studies, our estimate of prevalence of sibling bullying may be inaccurate. In contrast, even when selective dropout occurs, empirical simulations have shown that associations between exposure and outcome variables are only marginally affected (Wolke et al., 2009). However, findings require replication. Although, sibling bullying was measured via self-report, much of sibling bullying occurs behind closed doors and alternative parent reports have been found to underestimate the rate of sibling aggression with self-reports (Wolke et al., 2015).

Furthermore, whilst adjusting for a broad range of potential confounders had a minimal impact on our results, it remains possible that the association between sibling bullying perpetration or victimisation and psychotic disorder is due to residual confounding. Finally, we cannot eliminate the possibility of reverse causality as we

have no measure of parent psychotic disorder or of psychotic disorder available prior to the reported onset of sibling bullying before 8 years. However, this seems an unlikely explanation for our findings given that psychotic disorder prior to this age is extremely rare.

8.6.2 Conclusion

Our study adds that children involved in sibling bullying are at increased risk of developing a psychotic disorder, in keeping with findings for other kinds of stressors during childhood. If causal, as suggested by our study, this highlights the need for parents and health professionals to identify and put into place mechanisms to minimize sibling bullying within families. Interventions that focus on social skill training of children and mediation techniques for parents have been found to be helpful in alleviating sibling aggression (Tucker & Finkelhor, 2015).

CHAPTER NINE: Final Discussion

Overview: *This chapter will serve as the final discussion of this thesis. It will first provide a general summary of the main results pertaining to the antecedents (chapter six) and consequences (chapter seven & eight) of sibling bullying and it will then integrate these within the wider context of the existing literature. Next, some of the central strengths and limitations of the work will be outlined. Last, practical and research implications will be addressed and suggestions for future work will be made.*

9.1 The Key Findings

The aims of this research were twofold. Firstly, to systematically explore a range of potential childhood precursors of sibling bullying in middle childhood in order to test a number of competing theoretical frameworks that have been put forward to explain the development of sibling aggression (study one). Secondly, to investigate the prospective association between sibling bullying in middle childhood and high-risk behaviour in early adulthood (study two) as well as psychotic disorder in late adolescence/early adulthood (study three). The key findings were as follows:

- *Sibling bullying is frequent*: The overall prevalence (victim, bully-victim or bully) was found to be 28.1 %. In respect to sibling bullying status groups, bully-victims made up the largest group of children (11.3%), followed by victims (9.7%) and finally bullies (7.1%). Children reported the onset of sibling bullying at around the age of 8 years, on average, for both victimisation and perpetration. Psychological sibling bullying (i.e. name calling) was reported as the most frequent type of bullying.

- *Sibling bullying is ubiquitous* affecting children across all socioeconomic backgrounds, irrespective of parental educational levels, social class or marital status.

- *Structural family characteristics* as well as *sex* were found to be the strongest predictors of sibling bullying in middle childhood; even after accounting for

parent and parenting characteristics, early social experiences and child individual differences (study one). Parenting, early social experiences and child individual differences also predicted sibling bullying but to a lesser degree.

- The following precursors of specific sibling bullying roles emerged (study one):
    - *Victims:* Presence of older brothers, spending more time in joint activities with siblings, experiencing peer victimisation, being female, having low self-esteem and high levels of external locus of control.
    - *Bully-Victims*: First-born children, presence of older brothers, growing up in households with more siblings, experiencing high levels of conflict between parents, being victimised by siblings in early childhood, spending more time in joint activities with siblings, experiencing peer victimisation, being female and displaying higher levels of externalizing problems, higher levels of social cognition and antisocial behaviour.
    - *Bullies:* First-born children, growing up in households with more siblings, experiencing suboptimal parenting (e.g. hitting or shouting), spending more time in joint activities with siblings, being male and displaying higher levels of externalizing problems, higher levels of social cognition and antisocial behaviour.

- *Adverse long term consequences* are associated with sibling bullying (study two & study three):
    - *For Victims*: Increased odds of psychotic disorder in late adolescence/early adulthood.
    - *For Bully-Victims*: Increased odds of psychotic disorder in late adolescence/early adulthood as well as antisocial behaviour in early adulthood.
    - *For Bullies*: Increased odds of psychotic disorder in late adolescence/early adulthood as well as increased odds of antisocial behaviour, criminal involvement and illicit drug use in early adulthood.

- *Sibling and peer bullying have cumulative adverse consequences*: Those involved in sibling *and* peer bullying perpetration had the highest risk for antisocial behaviour, criminal involvement and illicit drug use in early adulthood (study two). In contrast, those victimised by siblings *and* peers had the highest risk for psychotic disorder in late adolescence/early adulthood (study three).

9.2 Integrated Discussion

Our longitudinal research supports existing cross-sectional studies that have found an association between sibling bullying and a range of adverse consequences pertaining to behavioural and mental health outcomes (Duncan, 1999; Wolke & Samara, 2004; Wolke & Skew, 2011; Toseeb et al., 2018; Tucker et al., 2013; van Berkel, Tucker, & Finkelhor, 2018). Our findings provide novel contributions to the field by illustrating for the first time that sibling bullying in middle childhood is a potential trauma that uniquely and prospectively predicts the development of psychotic disorder. Furthermore, our research is one of the first studies to show that sibling bullying perpetration in middle childhood is independently associated with high-risk behaviour in early adulthood. Thus, sibling bullying should not be further ignored or normalized. It must be taken serious and warrants special attention by researchers, health professionals and parents.

Unlike previous studies (Erisken & Jensen, 2006; Tippett & Wolke, 2015; van Berkel et ao., 2018; Tucker et al., 2014; Updegraff et al., 2005), our theoretically guided investigation of precursors of sibling bullying has allowed for a systematic comparison of several explanatory models of sibling aggression. Our distinctive theory driven approach utilized in study one (chapter six) indicates that structural family characteristics (e.g. being first-born) were the major drivers of sibling bullying perpetration. These findings are in line with an evolutionary model of sibling aggression and reflect the individual's desire to acquire or restore social dominance (Hawley, 1999). This mirrors findings from the peer bullying literature, which similarly suggests peer bullying as an evolutionary adaptive behaviour (Volk et al., 2012). However, the underlying incentive for engaging in the bullying behaviour

varies across the sibling and peer domain. In the peer context, bullying appears to be utilized as a mean of establishing or gaining a social standing within the peer group, either in regards to popularity, social status or intrasexual competition (Dane, Marini, Volk, & Vaillancourt, 2017; Koh & Wong, 2017; Volk et al., 2012). Conversely, bullying between siblings appears to emerge as a consequence of resource loss (e.g. birth of a sibling), whereby children employ bullying as a mean of regaining their social dominance after facing the loss thereof. Taken together, peer bullying appears to relate largely to *gaining* resources, whereas the core of sibling bullying appears to relate to minimizing losses and *regaining* or maintaining resources.

The general consensus from the peer bullying literature suggests that children who assume the bully-victim role suffer the greatest long-term consequences in a range of domains including mental health, social relationships, economic adjustment and criminality, followed by those children who are pure victims. In contrast, those children who are pure bullies in the school context are left largely unaffected by adverse outcomes and adapt fairly well into adulthood (Klomek et al., 2015; Wolke et al., 2013; Wolke & Lereya, 2015). These findings are in stark contrast to our findings on sibling bullies. Study two (chapter seven) revealed that perpetrating sibling bullying was associated with high-risk behaviour and sibling bullies were found to suffer the greatest adverse consequences. On the other hand, study three (chapter eight) found that involvement in *any* sibling bullying role (victim, bully-victim, bully) was predictive of psychotic disorder. One plausible explanation for the discrepancy between peer and sibling bullying may lie within the different kinds of evolutionary pressures that children face as a consequence of the type of bullying behaviour they are involved in. As discussed above, sibling bullies are faced with a loss of status where some fight in order to maintain or regain a dominant role within the family context. Peer bullies on the other hand are preoccupied with the initial acquisition or to gain a dominant role within the peer context. Research within the realms of social psychology has argued that individuals are more sensitive towards losses versus gains; with resource losses having a greater impact on an individual's wellbeing compared to resource gains (Freund & Riedger, 2001; Hobfoll, 1989, 1998, 2002). It is hence possible, that sibling bullying perpetration is related to higher levels of stress in comparison to peer bullying, which may in turn result in poorer adult outcomes for children who perpetrate aggression directed towards a sibling. This may be further

supported by findings that peer bullies gain high status and popularity and often have helpers (bully-victims) that are instigated to carry out the bullying attacks (Grandeau & Cillessen, 2006). Their status protects them from constantly having to fight (i.e. they are not attacked as high status individuals) and allows them to turn into an invisible aggressor taking minimum risks (Garandeau & Cillessen, 2006). This may explain that they are otherwise well adapted (Wolke et al., 2013) and thereby show less stress and inflammation (Copeland et al., 2013). In sibling relationships, the repeated aggression appears to be more finely poised with the largest group being those who are both perpetrating and becoming victims (bully-victims). One may speculate that even bullies may never be sure whether they maintain their status in the family with parents as another regulator of social interactions involved.

A major suggestion from the literature has further been that sibling and peer bullying roles are homotypically related (Tanrikulu & Campbell, 2015; Tippett & Wolke, 2015; Tucker et al., 2014a). A similar cross-over effect between sibling bullying and peer bullying roles was observed in our research. More importantly however, our research adds to the existing literature on the cumulative effects of experiencing multiple trauma in childhood (Edwards, Holden, Felitti, & Anda, 2003; Hodges, Godbout, Briere, Lanktree, Gilbert, & Kletzka, 2013; Houston, Shevlin, Adamson, & Murphy, 2011; Suliman, Mkabile, Fincham, Ahmed, Stein & Seedat 2009; Tanskanen et al., 2004). Experiencing multiple traumatic events during childhood, including maltreatment, abuse or peer bullying have previously been shown to predict both psychosis (Shevlin, Houston, Dorahy, & Adamson, 2008) and high-risk behaviour (Layne et al., 2013) in a dose-response fashion. Our findings suggest that sibling bullying too, must be considered as a type of childhood trauma that has lasting adverse outcomes. Our investigation of a possible dose-response effect revealed that sibling bullying and peer bullying were cumulatively associated with psychotic disorder and high-risk behaviour. This highlights the importance of considering sibling and peer bullying as independent kinds of childhood trauma that must both be integrated in future studies investigating antecedents of adverse adult outcomes as well as research dedicated to multiple trauma.

9.3 Strengths and Limitations of Study

There are several strengths of the reported studies. First, the use of a large nationally representative longitudinal birth-cohort, the Avon Longitudinal Study of Parents and Children (ALSPAC) allows for a wider generalisability of our findings, at least in the UK. The longitudinal design has further enabled us to draw time-ordered conclusions from our results. Moreover, compared to previous studies that have included measures of sibling bullying using small sample sizes (see Table 1.2), ALSPAC has allowed us to incorporate a relatively large sample size of over 6,000 individuals who reported on sibling bullying. The large sample size provided the necessary statistical power to investigate a wide set of precursor variables and outcomes..

Second, the use of ALSPAC data made it possible to include a breadth of topics and concepts that have been measured across multiple time-points. This has allowed us to investigate a large number of potential antecedents of sibling bullying across four main sets of precursors (structural family characteristics, parent and parenting characteristics, early social experiences and child individual differences) that had emerged from the literature. Furthermore, the dataset made it possible to explore some of the long-term consequences of sibling bullying in the domains of mental health (psychotic disorder) and high-risk behaviour (antisocial behaviour, criminal involvement, alcohol use, illicit drug use, cannabis use, nicotine dependence). Likewise, it enabled the inclusion of a range of potential confounders, which increases the confidence of a likely causal relationship between our exposure and outcome variables.

A third core strength of this research was the nature of the sibling bullying measure utilized in this thesis. As discussed in chapter one, one of the greatest challenges within the current sibling bullying literature has been the inconsistent use of terminology and the absence of an accepted definition amongst scholars. In accordance to the sibling bullying definition in Box 1.1 (Wolke et al., 2015), this thesis has aimed to measure sibling bullying in a concise manner by defining sibling bullying as repeated (i.e. at least once a week) intentional harm doing that is either physical (e.g. hitting, kicking or pushing), psychological (e.g. saying nasty and hurtful things) or social (e.g. telling lies or spreading rumours) occurring in the past 6 months. We have thereby captured a specific timeframe, frequency and cut-off points as well as type of bullying

behaviour. The measure of sibling bullying has furthermore been previously used (Wolke & Samara, 2004; Bowes et al., 2014) and can be considered as a valid measure. Taken together, our sibling bullying measure supports the use of a more comprehensive definition of sibling bullying and thereby allows for future comparisons and replications of our findings in the sibling bullying domain.

There are also some limitations of the reported studies that should be addressed. First, the sibling bullying measure in ASLPAC was only introduced at 12 years of age when funding from the Home Office to Jean Golding and Dieter Wolke for the sibling bullying measurement inclusion became available. This may be considered as a limitation for the following reasons: (1) Sibling victimisation has previously been reported in cross-sectional surveys to peak between the ages of 2 – 9 years and subsequently decrease between the age of 10 – 17 years (Tucker et al., 2013a). Hence, measurement of sibling bullying and its development during childhood was not possible. (2) Repeated measurement of sibling bullying across multiple timepoints would have allowed to determine the dose-response effects of chronic vs. non-chronic sibling bullying on later outcome as previously reported for peer bullying (Wolke et al., 2014; Zwiezynska et al., 2013). Nevertheless, that a single measure of sibling bullying at 12 years was found to predict adverse mental health outcomes does strongly indicate that sibling bullying should not be further normalised.

A second limitation is that this thesis was based on a pregnancy cohort in which only one child born in the recruitment period per family was included. For this reason, study child reports about sibling bullying were only available from the target study-child followed from pregnancy. This is a limitation, as there was no way of checking for agreement between the study child report on sibling bullying and that of their siblings. Future family studies should address this by including the complete household (i.e. sibling bullying reports by all children in the household). Moreover, collecting information about the child who is being bullied or who is bullying the study child may further help elucidate the motivations behind sibling bullying. Similarly, using child self-report measures only, may result in a bias of sibling bullying reports (e.g. self-desirability bias). While parent reports may not be the better alternative, considering that sibling aggression has frequently been found to occur behind closed

doors (Wolke et al., 2015), it may still be useful to consider incorporating some observational measures of sibling bullying in future studies.

Third, subject loss over the 18 year study period is inevitable and it should be considered that it was systematic with those of poorer households, less educated and minority groups being lost most frequently from follow-up. However, it has been shown that even with selective dropout accurate prediction may not be affected (Wolke et al., 2009). Nevertheless, it cannot be excluded, thus possible attrition bias was addressed through the application of sophisticated Multiple Imputation by Chained Equations algorithm in Stata 14.0 in order to account for missing values across all studies presented in this thesis. This statistical procedure allowed for a starting sample that matched the original outcome measure of each study.

A final limitation to consider is that although a large number of potential confounders were included, residual confounding cannot be excluded. On the other hand, including a large range of covariates may have resulted in overadjustment, biasing our results (e.g. driving the findings towards the null hypothesis).

9.4 Practical Implications

The are several practical implications that emerge from the findings reported in this thesis. Firstly, structural family characteristics and sex were identified as the strongest predictors of sibling bullying (study one). Findings suggest that female children who grow up with older brothers are at a particular risk for sibling victimisation, while first-born children who are male and grow up in households with more than one sibling are more likely to engage in sibling bullying perpetration. These findings have important implications in respect to prevention and family educational programs that are targeted at fostering healthy sibling relationships. Families may need more support in regard to communicating and dealing with first-born children who are confronted with the birth of a sibling (Chen, Han, Wang, Sui, Chen, 2018) Kramer & Ramsburg, 2002; Song & Volling, 2015). Advice pertaining to dealing with resource losses for first-borns may be of particular relevance, in light of our findings. Parents are the major agents of socialisation in early childhood and while parenting may not be the major cause of sibling bullying, it may protect against sibling bullying or improve

sibling relationships. Such information could for example be provided in antenatal preparation classes.

Second, for parents who are struggling with sibling bullying, psychoeducational programs may be helpful in order to increase awareness and inform parents of the serious long-term consequences that sibling bullying may have. Moreover, prevention measures may be put in place in order to help parents deal with sibling aggression and offer appropriate intervention strategies that allow them to intervene in a consistent and effective manner, so that sibling relationships can be improved, and long-lasting positive sibling relations are promoted (Pickering & Sanders, 2016). There is some evidence suggesting that helping children strengthen their social skills during sibling interactions (Kennedy & Kramer, 2008; Kramer & Radey, 1997; Thomas & Roberts, 2009) or training parents in mediation techniques during sibling conflict (Siddiqui & Ross, 2004; Smith & Ross, 2007) may enhance positive sibling relationships (Tucker & Finkelhor, 2017; Wolke et al., 2015; Feinberg, Solmeyer, & McHale, 2012; Feinberg, Sakuma, Hoestetler, & McHale, 2013). Similarly, recent evidence from a retrospective study has shown that interventions focused on children's social and emotional development may specifically reduce sibling bullying victimisation (Bouchard et al., 2018). Taken together, these findings highlight the importance of early parental action in respect to negative sibling interactions. Health professionals in hospitals, antenatal preparation classes or those working with children would be a good source for parents to learn about effective parenting strategies targeted at improving sibling relationships and help those who are experiencing sibling conflict in the home.

Finally, child health professionals should be given training on what we know about aggression between siblings and the potential ways of improving sibling relationships so that this information can be communicated effectively to parents. Clinicians who work with children and young people (e.g. therapists, psychologists or GPs) should furthermore be encouraged to routinely enquire about experiences of sibling bullying, as this may act as an early warning sign of long-term problems and poor mental health. Lastly, in light of the findings presented in study two, health professionals should also monitor early aggressive tendencies, especially if these occur within the sibling

context, as these may further be a marker of an antisocial behaviour trajectory (Solmeyer et al., 2014).

9.5 Research Implications and Future Directions

The findings presented in this thesis also have several research implications and suggestions for future directions. First, in order for appropriate prevention programs to be developed that are aimed at fostering positive sibling relationships and helping parents deal with the arrival of a sibling, future studies should plan to track children's adjustment over time (Beyers-Carlson & Volling, 2018; Kolak & Volling, 2013; Volling, 2012). Well-designed long-term longitudinal studies that are able to capture specific aspects of the family transitions following the birth of a sibling may in turn help professionals to formulate evidence-based recommendations to help parents prepare their first-born children on welcoming a new sibling (Volling, 2012).

Another interesting avenue for future research would be to explore the potential mechanisms underlying the observed predictions. A number of potential precursors have been identified in study one, however the possible interplay between these antecedents has not yet been explored and therefore remits further attention. Scholars should therefore design future studies dedicated to the exploration of possible mediator, moderator and interaction effects between the precursors identified by this thesis, in order to understand the emergence of sibling bullying behaviour better. For instance, investigating suboptimal parenting as potential mediators or moderator of birth-order effects may help illuminate possible routes for more effective interventions (i.e. it is not possible to change the birth-order, however it is possible to improve parenting). More specifically, if findings would indicate that suboptimal parenting mediates or moderates the relationship between being first-born and becoming a sibling bully, this would suggest that changing suboptimal parenting could reduce the strength of association between being first-born and becoming a bully.

Third, there is a need for physiological studies in the domain of sibling bullying in order to help identify potential biomarkers and better understand the underlying mechanisms that may be associated with sibling bullying. On the one hand, this would allow for speculations to be made about how sibling bullying may become biologically

embedded on a physiological level (Vaillancourt, Haymel, & McDougall, 2013). This would in turn have important implications on understanding how sibling bullying may result in adverse outcomes (i.e. physical or mental health). On the other hand, it would be possible for specific comparisons to be drawn between sibling and peer bullying, helping to elucidate any possible underlying differences between these two kinds of bullying. One specific direction for research could pertain to exploring aspects of inflammation, a biological marker that has previously been proposed to link early adverse experiences to poor adult health (Danese, Pariante, Caspi, Taylor, & Poulten, 2007). Evidence from the peer bullying literature shows that bullied children are found to have higher increases of inflammation, whereas children who act as bullies are found to have lower increases of inflammation (Copeland, Wolke, Lereya, Shanahan, Wotherman, & Costello, 2014). Future studies that aim to explore whether the experience of sibling bullying perpetration is associated with higher levels of inflammatory markers, may help explain the discrepancy in our findings between sibling and peer bullying and adverse outcomes.

Fourth, sibling bullying should be integrated more firmly in future studies on developmental psychopathology. Our findings suggest that sibling and peer bullying contribute independently to psychotic disorder and high-risk behaviour. Hence, future research on multiple trauma needs to place a stronger emphasis on incorporating sibling bullying as an additional possible marker contributing towards adverse developmental outcomes. Moreover, future work that is dedicated to peer bullying should additionally consider sibling bullying as both a control and a covariate in order to parcel out any possible independent or cumulative effects.

Lastly, there are currently no prevention or intervention programmes that have specifically been tailored towards reducing or preventing sibling bullying from occurring (Bouchard, Plamondon, & Lahance-Grzela, 2018; Wolke et al., 2015). There is an urgent need for health professionals and researchers to develop, implement and evaluate such programmes. Especially longitudinal intervention programmes are needed in order to test whether long-term consequences may be alleviated or reversed. This is key in order to improve mental health and behavioural consequences for young people who have experienced sibling bullying.

9.5. Conclusion

Sibling bullying should not be discounted as harmless and normative behaviour or be perceived as an integral part of growing up. The findings from this research show that sibling bullying is predictive of a range of long-term behavioural and mental health consequences lasting into early adulthood. It is imperative that sibling bullying is put firmly on the research agenda of scholars working in the field of developmental psychology and psychopathology and that funding is made available for this particular research domain. Moreover, there is a strong need for the development, implementation and evaluation of prevention and intervention studies. Finally, it is important for parents and health professionals to be made aware of the harmful effects of sibling bullying. Parents need to take sibling bullying seriously and health professionals should be urged to ask routinely about aggression between siblings.

REFERENCES

Addington, J., Penn, D., Woods, S. W., Addington, D., & Perkins, D. O. (2008). Social functioning in individuals at clinical high risk for psychosis. *Schizophrenia Research, 99,* 110-124. doi:10.1016/j.schres.2007.10.001

Adriano, F., Caltagirone, C., & Spalletta, G. (2012). Hippocampal volume reduction in first-episode and chronic schizophrenia: A review and meta-analysis. *Neuroscientist, 18,* 180-200. doi:10.1177/1073858410395147

Agnew, R. (1992). Foundation for a general strain theory of crime and delinquency. *Criminology, 30,* 47-87. doi:10.1111/j.1745-9125.1992.tb01093.x

Agnew, R. (2001). Building on the foundation of general strain theory: Specifying the types of strain most likely to lead to crime and delinquency. *Journal of Research in Crime and Delinquency, 38,* 319-361. http://doi.org/10.1177/0022427801038004001

Aguilar, B., O'Brien, K. M., August, G. J., Aoun, S. L., & Hektner, J. M. (2001). Relationship quality of aggressive children and their siblings: A multiinformant, multimeasure investigation. *Journal of Abnormal Child Psychology*, *29*, 479–489. doi:10.1023/A:1012273024211

Alemany, S., Arias, B., Aguilera, M., Villa, H., Moya, J., Ibáñez, M. I., … Fañanás, L. (2011). Childhood abuse, the BDNF-Val66Met polymorphism and adult psychotic-like experiences. *British Journal of Psychiatry*, *199*, 38–42. doi:10.1192/bjp.bp.110.083808

Appiah-Kusi, E., Fisher, H. L., Petros, N., Wilson, R., Mondelli, V., Garety, P. A., … Bhattacharyya, S. (2017). Do cognitive schema mediate the association between childhood trauma and being at ultra-high risk for psychosis? *Journal of Psychiatric Research*, *88*, 89–96. doi:10.1016/j.jpsychires.2017.01.003

Archer, J. (2004). Sex differences in aggression in real-world settings: A meta-analytic review. *Review of General Psychology, 8,* 291-322. doi:10.1037/1089-2680.8.4.291

Archer, J. (2013). Can evolutionary principles explain patterns of family violence? *Psychological Bulletin*, *139,* 403-440. doi: 10.1037/a0029114.

Armstrong, R. A. (2014). When to use bonferroni correction. *Ophthalmic & Physiological Optics, 34,* 502-508. doi:10.1111/opo.12131

Arseneault, L., Moffitt, T. E., Caspi, A., Taylor, P. J., & Silva, P. A. (2000). Mental disorders and violence in a total birth cohort: Results from the Dunedin study. *Archives of General Psychiatry*, *57*, 979–986. doi: 10.1001/archpsyc.57.10.979

Arseneault, L., Cannon, M., Fisher, H. L., Polanczyk, F., Moffitt, T. E., & Caspi, A. (2011). Childhood trauma and children's emerging psychotic symptoms: A genetically sensitive longitudinal cohort study. *The American Journal of Psychiatry,* 168, 65-72. doi:10.1176/appi.ajp.2010.10040567

Azmitia, M., & Hesser, J. (1993). Why Siblings Are Important Agents of Cognitive Development: A Comparison of Siblings and Peers. *Child Development*, *64*, 430–444. doi:.1111/j.1467-8624.1993.tb02919.x

Babinski, L. M., Hartsough, C. S., & Lambert, N. M. (1999). Childhood conduct problems, hyperactivity-impulsivity, and inattention as predictors of adult criminal activity. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *40*, 347–355. doi:10.1017/S002196309800362X

Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B., & Monteiro, M. G. (2001). *The alcohol use disorders identification test. Guidelines for use in primary care* (2nd ed.). World Health Organization, Geneva.

Baldry, A. C. (2003). Bullying in schools and exposure to domestic violence. *Child Abuse & Neglect, 27,* 713-732. doi: 10.1016/S0145-2134(03)00114-5

Bandura, A. (*1969*). Social-learning theory of identificatory processes. In D. A. Goslin (Ed.), *Handbook of socialization theory and research* (pp. 213-262). Chicago: Rand McNally.

Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice Hall.

Bank, L., & Burraston, J. (2004). Sibling conflict and ineffective parenting as predictors of adolescent boys antisocial behaviour and peer difficulties:

Additive and interactional effects. *Journal of Research and Adolescence, 14*, 99-125. doi:10.1111/j.1532-7795.2004.01401005.x

Bar-Zomer, J., & Klomek, A. B. (2018). Attachment to parents as a moderator in the association between sibling bullying and depression or suicidal ideation among children and adolescents. *Frontiers in Psychiatry*, *9,* 1-9. doi:10.3389/fpsyt.2018.00072

Bebbington, P. E., Bhugra, D., Brugha, T., Singleton, N., Farrell, M., … & Meltzer, H. (2004). Psychosis, victimisation and childhood disadvantage: evidence from the second British national survey of psychiatric morbidity. *The British Journal of Psychiatry, 185,* 220-226. doi:10.1192/bjp.185.3.220

Beckett, S. (2018). *Beyond together or apart. Planning for assessing and placing sibling groups*. London: CoramBAAF.

Bedford, V. H., Volling, B. L., Avioli, P. S. (2000). Positive consequences of sibling conflict in childhood and adolescence. *The International Journal of Aging and Human Development, 51,* 53-69. doi:10.2190/G6PR-CN8Q-5PVC-5GTV

Bender, D., & Lösel, F. (2011). Bullying at school as a predictor of delinquency, violence and other anti-social behaviour in adulthood. *Criminal Behavior and Mental Health, 21*, 99-106. doi:10.1002/cbm.799

Bengtsson, H., & Arvidsson, Å. (2011). The impact of developing social perspective-taking skills on emotionality in middle and late childhood. *Social Development*, *20*, 353–375. doi:10.1111/j.1467-9507.2010.00587.x

Beyers-Carlson, E. E. A., & Volling, B. L. (2017). Efficacy of Sibling Preparation Classes. *JOGNN - Journal of Obstetric, Gynecologic, and Neonatal Nursing*, *46*, 521–531. doi:10.1016/j.jogn.2017.03.005

Bongers, I. L., Koot, H. M., van der Ende, J., & Verhulst, F. C. (2008). Predicting young adult social functioning from developmental trajectories of externalizing behaviour. *Psychological Medicine*, *38*, 989–999. doi:10.1017/S0033291707002309

Booth, C. L. (1994). Predicting social adjustment in middle childhood: the role of preschool attachment security and maternal style. *Social Development*, *3*, 189–204. doi:10.1111/j.1467-9507.1994.tb00040.x

Bouchard, G., Plamondon, A., & Lachance-Grzela, M. (2018). Parental intervention style and adult sibling conflicts. The mediating role of involvement in sibling bullying. *Journal of Social and Personal Relationships,* 1-8. doi:10.1177/0265407518793227

Bowen, E., Heron, J., Waylen, A., Wolke, D., ALSPAC study team. (2005). Domestic violence risk during and after pregnancy: findings from a British longitudinal study. *BJOG: International Journal of Obstetrics and Gynecology*, *112,* 1083–1089. doi: 10.1111/j.1471-0528.2005.00653.x

Bowen, E., & Dixon, L. (2010). Concurrent and prospective associations between facial affect recognition accuracy and childhood antisocial behavior. *Aggressive Behavior*, *36*, 305–314. doi: 10.1002/ab.20357

Bowes, L., Wolke, D., Joinson, C., Lereya, S.T., & Lewis, G. (2014). Sibling bullying and risk of depression, anxiety, and self-harm: a prospective cohort study. *Pediatrics, 134,* e1032–39. doi:10.1542/peds.2014-0832

Bowlby, J. (1969). *Attachment and loss: Vol. 1*. New York: Basic Books.

Boyd, A., Folding, J., Macleod, J., Lawlor, D. A., Fraser, A., Henderson, J., Molloy, L., Ness, A., Ring, S., & Davey-Smith, G. (2013). Cohort profile: the 'children of the 90s'-the index offspring of the avon longitudinal study of parents and children. *International Journal of Epidemiology 42,* 111-127. doi:10.1093/ije/dys064

Bönsch, D., Wunschel, M., Lenz, B., Janssen, G., Weisbrod, M., & Sauer, H. (2012). Methylation matters? Decreased methylation status of genomic DNA in the blood of schizophrenic twins. *Psychiatry Research*, *198*, 533–537. doi:10.1016/j.psychres.2011.09.004

Bradley, A. J., & Dinan, T. G. (2010). A systematic review of hypothalamic-pituitary-adrenal axis function in schizophrenia: implications for mortality. *Journal of Psychopharmacology*, *24*, 91–118. doi:10.1177/1359786810385491

Brody, G. (1998). Sibling relationship quality: its causes and consequences. *Annual Review of Psychology, 49,* 1-24. doi:10.1146/annurev.psych.49.1.1

Brody, G. H. (2004). Siblings' direct and indirect contributions to child development. *Current Directions in Psychological Science, 13,* 124-126. doi:10.1111/j.0963-7214.2004.00289.x

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Boston, MA: Harvard University Press.

Buhrmester, D., & Furman, W. (1990). Perceptions of Sibling Relationships during Middle Childhood and Adolescence. *Child Development*, *61*, 1387–1398. doi:10.1111/j.1467-8624.1990.tb02869.x

Buist, K. L. (2010). Sibling relationship quality and adolescent delinquency: A latent growth curve approach. *Journal of Family Psychology, 24*, 400-410. doi:10.1037/a0020351

Buist, K. L., Deković, M., & Prinzie, P. (2013). Sibling relationship quality and psychopathology of children and adolescents: A meta-analysis. *Clinical Psychology Review, 33,* 97-106. doi:10.1016/j.cpr.2012.10.007.

Buist, K. L., & Vermande, M. (2014). Sibling relationship patterns and their associations with child competence and problem behavior. *Journal of Family Psychology, 28,* 529-537. doi:10.1037/a0036990

Button, D. M., & Gealt, R. (2010). High risk behaviors among victims of sibling violence. *Journal of Family Violence, 25,* 131-140. doi:10.1007/s10896-009-9276-x

Caffaro, J. V. (2014). *Sibling abuse trauma: assessment and intervention strategies for children, families, and adults* (2nd ed.). New York, NY: Routledge

Campbell, M. L., & Morrison, A. P. (2007). The relationship between bullying, psychotic-like experiences and appraisals in 14-16-year olds. *Behavioral Research Therapy,* 4, 65-79. doi:10.1016/j.brat.2006.11.009

Carey, W. B. (1970). A simplified method for measuring infant temperament. *The Journal of Pediatrics, 77,* 188-194. doi:10.1016/S0022-3476(70)80322-5

Card, N. A., Stucky, B. D., Sawalani, G. M., & Little, T. D. (2008). Direct and indirect aggression during childhood and adolescence: A meta-analytic review of gender differences, intercorrelations, and relations to maladjustment. *Child Development*, *79*, 1185–1229. doi:10.1111/j.1467-8624.2008.01184.x

Caspi, J., & Barrios, V. R. (2016). Destructive sibling aggression. In C. A. Cuevas & C. M. Rennison (Eds.), *The Wiley Handbook on the Psychology of Violence* (pp. 297-323). Oxford: Wiley Blackwell.

Caya, M. L., & Liem, J. H. (1998). The role of sibling support in high-conflict families. *American Journal of Orthopsychiatry, 68,* 327-333. doi:10.1037/h0080342

Chen, B., Han, W., Wang, Y., Sui, Y., Chen, Z., & Wan, L. (2018). The relationship between Chinese mothers' parenting stress and sibling relationships: a moderated mediation model of maternal warmth and co-parenting. *Early Child Development and Care,* 158-167. doi:10.1080/02646838.2018.1437257

Collip, D., Wigman, J. T. W., Myin-Germeys, I., Jacobs, N., Derom, C., Thiery, E., Wichers, M., & van Os, J. (2013). From Epidemiology to Daily Life: Linking Daily Life Stress Reactivity to Persistence of Psychotic Experiences in a Longitudinal General Population Study. *PLoS One*, 8, e62688. doi:10.1371/journal.pone.0062688

Compton, K., Snyder, J., Schrepferman, L., Bank, L., & Shortt, J. W. (2003). The contribution of parents and siblings to antisocial and depressive behaviour in adolescents: A double jeopardy coercion model. *Developmental Psychopathology, 15*, 163-182. doi:10.1017/S0954579403000099

Cook, C. R., Williams, K. R., Guerra, N. G., Kim, T. E., & Sadek, S. (2010). Predictors of bullying and victimization in childhood and adolescence: A meta-analytic investigation. *School Psychology Quarterly, 25,* 65-83. doi:10.1037/a0020149

Copeland, W. E., Wolke, D., Angold, A., & Costello, E. J. (2013). Adult psychiatric outcomes of bullying and being bullied by peers in childhood

and adolescence. *JAMA Psychiatry*, *70*, 419–426. doi: 10.1001/jamapsychiatry.2013.504

Copeland, W. E., Wolke, D., Lereya, S. T., Shanahan, L., Worthman, C., & Costello, E. J. (2014). Childhood bullying involvement predicts low-grade systemic inflammation into adulthood. *Proceedings of the National Academy of Sciences*, *111*, 7570–7575. doi:10.1073/pnas.1323641111

Cornblatt, B. A., Carrión, R. E., Addington, J., Seidman, L., Walker, E. F., Cannon, T. D., … Lencz, T. (2012). Risk factors for psychosis: Impaired social and role functioning. *Schizophrenia Bulletin*, *38*, 1247–1257. doi: 10.1093/schbul/sbr136

Cox. J. L., Holden, J. M., & Sagovsky, R. (1987). Detection of postnatal depression. Development of the 10-item Edinburgh postnatal depression scale. *British Journal of Psychiatry 150,* 782-786. doi.org/10.1192/bjp.150.6.782

Cox, M. J. (2010). Family systems and sibling relationships. *Psychology and Neuroscience, 4,* 95-96. doi: 10.1111/j.1750-8606.2010.00124.x

Coyl, D. D., Roggman, L. A., & Newland, L. A. (2002). Stress, maternal depression, and negative mother-infant interactions in relation to infant attachment. *Infant Mental Health Journal*, *23*,145–163. doi:10.1002/imhj.10009

Coyle, S., Demaray, M. K., Tennant, J. E., Klossing, J. (2017). The association among sibling and peer bullying, social support and internalizing behavior. *Child & Youth Care Forum,* 46, 895-922. doi:10.1007/s10566-017-9412-3

Criss, M. M., & Shaw, D. S. (2005). Sibling relationships as contexts for delinquency training in low-income families. *Journal of Family Psychology, 19*, 592-600. doi:10.1037/0893-3200.19.4.592

Cunningham, T., Hoy, K., & Shannon, C. (2016). Does childhood bullying lead to the development of psychotic symptoms? A meta-analysis and review of prospective studies. *Psychosis*, *8,* 48-59. doi:10.1080/17522439.2015.1053969

Dane, A. V., Marini, Z. A., Volk, A. A., & Vaillancourt, T. (2017). Physical and relational bullying and victimization: Differential relations with adolescent dating and sexual behavior. *Aggressive Behavior*, *43*, 111–122. doi:10.1002/ab.21667

Danese, A., Pariante, C. M., Caspi, A., Taylor, A., & Poulton, R. (2007). Childhood maltreatment predicts adult inflammation in a life-course study. *Proceedings of the National Academy of Sciences*, *104*, 1319–1324. doi:10.1073/pnas.0610362104

Dantchev, S., Zammit, S., & Wolke, D. (2018). Sibling bullying in middle childhood and psychotic disorder at 18 years: a prospective cohort study. *Psychological Medicine*, *48,* 2321-2328. doi:10.1017/S0033291717003841

Dantchev, S., & Wolke, D. (2018). Sibling bullying at 12 years and high-risk behavior in early adulthood: a prospective cohort study. *Aggressive Behavior,* 1-15. doi:10.1002/ab.21793

Darwin, C. R. (1859). The origin of species. London: John Murray.

Deater-Deckards, K., Dunn, J. (2002). Sibling relationships and social-emotional adjustment in different family contexts. *Social Development, 11,* 571-590. doi:10.1111/1467-9507.00216

Defoe, I. N., Keijsers, L., Hawk, S. T., Branje, S., Dubas, J. S., Buist, K., … & Meeus, W. (2013). Siblings versus parents and friends: Longitudinal linkages to adolescent externalizing problems. *Journal of Child Psychology and Psychiatry, 54*, 881-889. doi:10.1111/jcpp.12049

Dirks, M. A., Persram, R., Recchia, H. E., Howe, N. (2015). Sibling relationships as sources of risk and resilience in the development and maintenance of internalizing and externalizing problems during childhood and adolescence. *Clinical Psychology Review, 42,* 145-155. doi:10.1016/j.cpr.2015.07.003

Dishion, T. J., Snyder, J. J. (2016). *The oxford handbook of coercive relationship dynamics.* New York, NY: Oxford University Press.

Doinita, N. E., & Maria, N. D. (2015). Attachment and parenting styles. *Pocedia Social and Behavioral Sciences, 203,* 199-204. doi:10.1016/j.sbspro.2015.08.282

Dollard, J. M., Doob, N. E., Mowrer, L. W., & Sears, R. R. (1939). Frustration and aggression. New Haven, CT, US: Yale University Press.

Done, D. J., Crow, T. J., Johnstone, E. C., & Sacker, A. (1994). Childhood antecedents of schizophrenia and affective illness: social adjustment at ages 7 and 11. *BMJ, 309*, 699-703. doi:101136/bmj.309.6956.699

Duncan, R. D. (1999). Peer and sibling aggression: An investigation of intra- and extra-familial bullying. *Journal of Interpersonal Violence, 14*, 871-886. doi:10.1177/088626099014008005

Dunn, J., Brown, J., Slomkowski, C., Tesla, C., & Youngblade, L. (1991). Young children's understanding of other people's feelings and beliefs: Individual differences and their antecedents. *Child Development, 62,* 1352-1366. doi:10.2307/1130811

Dunn, J., Deater-Deckard, K., & Pickering, K. (1999). Siblings, parents, and partners: Family relationships within a longitudinal community study. *Journal of Child Psychology and Psychiatry, 40,* 1025-1037. doi:10.1111/1469-7610.00521

Durand, V., Hennessey, J., Wells, D. S., Crothers, L. M., Kolbert, J. B., Lipinski, J., & Hughes, T. L. (2013). Bullying and substance use in children and adolescents. *Journal of Addiction Research & Therapy, 4*, 1-6. doi:10.4172/2155-6105.1000158

East, P. L., & Rook, K. S. (1992). Compensatory Patterns of Support Among Children's Peer Relationships: A Test Using School Friends, Nonschool Friends, and Siblings. *Developmental Psychology*, *28*, 163–172. doi:10.1037/0012-1649.28.1.163

East, P. L., & Khoo, S. T. (2005). Longitudinal pathways linking family factors and sibling relationship qualities to adolescent substance use and sexual risk behaviors. *Journal of Family Psychology, 19*, 571-580. doi:10.1037/0893-3200.19.4.571

Edwards, V. J., Holden, G. W., Felitti, V. J., & Anda, R. F. (2003). Relationship between multiple forms of childhood maltreatment and adult mental health in community respondents: Results from the adverse childhood experiences

study. *American Journal of Psychiatry*, *160*, 1453–1460. doi:10.1176/appi.ajp.160.8.1453

Eisenberg, N., Fabes, R. A., Bernzweig, J., Karbon, M., Poulin, R., & Hanish, L. (1993). The relations of emotionality and regulation to preschoolers' social skills and sociometric status. *Child Development*, *64*, 1418–1438. doi:10.1111/j.1467-8624.1993.tb02961.x

Ensor, R., Marks, A., Jacobs, L., & Hughes, C. (2010). Trajectories of antisocial behaviour towards siblings predict antisocial behaviour towards peers. *Journal of Child Psychology and Psychiatry, 51*, 1208-1216. doi:10.1111/j.1469-7610.2010.02276.x

Eriksen, S., & Jensen, V. (2009). A push or a punch: distinguishing the severity of sibling violence. *Journal of Interpersonal Violence, 24,* 183–208. doi: 10.1177/0886260508316298

Espelage, D. L., Low, S., Rao, M. A., Hong, J. S., & Little, T. D. (2013). Family violence, bullying, fighting, and substance use among adolescents: A longitudinal mediational model. *Journal of Research on Adolescence, 24,* 1-13. doi:10.1111/jora.12060

Fagerstrom, K. O., Heatherton, T. F., & Kozlowski, L. T. (1990). Nicotine addiction and its assessment. *Ear, Nose, & Throat Journal, 69,* 763-765.

Fallon, B. J., & Bowles, T. V. (1997). The effect of family structure and family functioning on adolescents' perceptions of intimate time spent with parents, siblings, and peers. *Journal of Youth and Adolescence, 26,* 25–43. doi:10.1023/A:1024536128038

Farrington, D. P. (2005). Childhood origins of antisocial behavior. *Clinical Psychology and Psychotherapy, 12,* 177-190. doi:10.1002/cpp.448

Farrington, D. P., & Baldry, A. C. (2010) Individual risk factors for school bullying. *Journal of Aggression, Conflict and Peace Research, 2*, 4-16. doi:.5042/jacpr.2010.0001

Farrington, D. P., & Ttofi, M. M. (2011). Bullying as a predictor of offending, violence and later life outcomes. *Criminal Behavior and Mental Health, 21,* 90-98. doi:10.1002/cbm.801

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. Behavior Research Methods, 41, 1149-1160. doi: 10.3758/BRM.41.4.1149

Fazel, S., Gulati, G., Linsell, L., Geddes, J. R., & Grann, M. (2009). Schizophrenia and violence: Systematic review and meta-analysis. *PLoS Medicine, 6,* e1000120. doi:10.1371/journal.pmed.1000120

Feinberg, M. E., Solmeyer, A. R., & McHale, S. M. (2012). The Third Rail of Family Systems: Sibling Relationships, Mental and Behavioral Health, and Preventive Intervention in Childhood and Adolescence. *Clinical Child and Family Psychology Review, 15,* 43-57. doi:10.1007/s10567-011-0104-5

Feinberg, M. E., Sakuma, K. L., Hostetler, M., & McHale, S. M. (2013). Enhancing sibling relationships to prevent adolescent problem behaviors: Theory, design and feasibility of Siblings Are Special. *Evaluation and Program Planning*, *36*, 97–106. doi:10.1016/j.evalprogplan.2012.08.003

Felson, R. B. (1983). Aggression and violence between siblings. *Social Psychology Quarterly, 46*, 271-285. doi:10.2307/3033715

Fergusson, D. M., Horwood, L. J., & Ridder, E. M. (2005). Show me the child at seven: The consequences of conduct problems in childhood for psychosocial functioning in adulthood. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *46*, 837–849. doi:10.1111/j.1469-7610.2004.00387.x

Finkelhor, D. T., Turner, H., & Ormrod, R. (2006). Kid's stuff: The nature and impact of peer and sibling violence on younger and older children. *Child Abuse & Neglect, 30,* 1401-1421. doi:10.1016/j.chiabu.2006.06.006

Finkelhor, D., Turner, H. A., Shattuck, A., & Hamby, S. L. (2015). Prevalence of childhood exposure to violence, crime and abuse: Results from the national survey children's exposure to violence. *JAMA Pediatrics, 169,* 746–754. doi:10/1001/jamapediatrics

Fisher, H. L., Jones, J. B., Fearon, P., Craig, T. K., Dazzan, P., … & Morgan, C. (2010). The varying impact of type, timing and frequency of exposure to

childhood adversity on its association with adult psychiatric disorder. *Psychological Medicine, 40,* 1967-1978. doi:10.1017/S0033291710000231

Fraser, A., Macdonald-Wallis, C., Tilling, K., Brody, A., Golding, J., Davey-Smith, G., Henderson, J., Macleod, J., Molloy, L., Ness, A., Ring, S., Nelson, S. M., & Lawlor, D. A. (2013). The avon longitudinal study of parents and children: Alspac mothers cohort. *International Journal of Epidemiology, 42,* 97-110. doi:10.1093/ije/dys066

Freund, A. M., & Riediger, M. (2001). What I have and what I do - the role of resource loss and gain throughout life. *Journal of Applied Psychology*, *50*, 37–408. doi:10.1111/1464-0597.00063

Gass, K., Jenkins, J., & Dunn, J. (2007). Are sibling relationships protective? A longitudinal study. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *48*, 167–175. doi:10.1111/j.1469-7610.2006.01699.x

Garety, P. A., Kuipers, E., Fowler, D., Freeman, D., & Bebbington, P. E. (2001). A cognitive model of positive symptoms of psychosis. *Psychological Medicine,* 31, 189-195. doi:10.1017/S0033291701003312

Garety, P. A., Bebbington, P., Fowler, D., Freeman, D., & Kuipers, E. (2007). Implications for neurobiological research of cognitive models of psychosis: A theoretical paper. *Psychological Medicine, 37,* 1377-1391. doi:/10.1017/S003329170700013X

Garner, P. W., Jones, D. C., Palmer, D. J. (1994). Social cognitive correlates of preschool children's sibling caregiving behavior. *Developmental Psychology, 30,* 905-911. doi:10.1037/0012-1649.30.6.905

Golding, J., Pembrey, M., Jones, R., & ALSPAC Study Team. (2001). ALSPAC – The avon longitudinal study of parents and children I. Study methodology. *Paediatric and Perinatal Epidemiology, 15,* 74-87. doi: 10.1046/j.1365-3016.200100325.x

Goodman, R., Ford, T., Richards, H., Gatward, R., & Meltzer, H. (2000). The development and wellbeing assessment: Description and initial validation of an integrated assessment of child and adolescent psychopathology. *Journal*

of Child Psychology and Psychiatry and Allied Disciplines, 41, 645-655. doi:10.1111/j.1469-7610.2000.tb02345.x

Goodman, R. (2001). Psychometric properties of the strengths and difficulties questionnaire. *Journal of the American Academy of Child and Adolescent Psychiatry, 40,* 1337-1345. doi:10.1097/00004583-200111000-00015

Garandeau, C. F., & Cillessen, A. H. N. (2006). From indirect aggression to invisible aggression: A conceptual view on bullying and peer group manipulation. *Aggression and Violent Behaviour, 11,* 612-625. doi:10.1016/j.avb.2005.08.004

Gross, J. J., & Jazaieri, H. (2014). Emotion, emotion regulation and psychopathology. An affective science perspective. *Clinical Psychological Science, 2,* 387-401. doi:101177/2167702614536164

Guy, A., Lee, K., & Wolke, D. (2017). Differences in the early stages of social information processing for adolescents involved in bullying. *Aggressive Behavior*, *43,* 578-587. doi:10.1002/ab.21716

Hahm, H. C., Lee, Y., Ozonoff, A., & van Wert, M. J. (2010). The impact of multiple types of child maltreatment on subsequent risk behaviors among women during the transition from adolescence to young adulthood. *Journal of Youth and Adolescence*, *39*, 528–540. doi:10.1007/s10964-009-9490-0

Hall, C. W. (2006). Self-reported aggression and the perception of anger in facial expression photos. *Journal of Psychology: Interdisciplinary and Applied*, *140*, 255–267. doi:10.3200/JRLP.140.3.255-267

Hardy, M. S. (2001). Physical aggression and sexual behavior among siblings: A retrospective study. *Journal of Family Violence*, *16*, 255–268. doi:10.1007/s10826-013-9725-2

Hardy, A., Emsley, R., Freeman, D., Bebbington, P., Garety, P. A., … & Fowler, D. (2016). Psychological mechanisms mediation effects between trauma and psychotic symptoms: The role of affect regulation, intrusive trauma memory, beliefs, and depression. *Schizophrenia Bulletin, 42,* 34-43. doi: 10.1093/schbul/sbv175

Harter, S. (1985). *Self-perception profile for children*. Denver, CO: University of Denver.

Hartup, W. W. (1989). Social Relationships and Their Developmental Significance. *American Psychologist*, *44*, 120–126. doi:10.1037/0003-066X.44.2.120

Hawley, P. E. (1999). The ontogenesis of social dominance: A strategy-based evolutionary perspective. *Developmental Review, 19,* 97-132. doi:10.1006/drev.1998.0470

Haynie, D. L., Nansel, T., Eitel, P., Crump, A. D., Saylor, K., Yu, K., Simons-Morton, B. (2001). Bullies, victims, and bully/victims: distinct groups of at-risk youth. *The Journal of Early Adolescence, 21,* 29-49, doi:10. 1177/0272431601021001002

Heatherton, T. W., Kozlowski, L. T., Frecker, R. C., & Fagerström, K.-O. (1991). The Fagerström test for nicotine dependence: A revision of the Fagerström tolerance questionnaire. *British Journal of Addiction, 86,* 1119-1127. doi:10.1111/j.1360-0443.1991.tb01879.x

Hepgul, N., Pariante, C. M., Dipasquale, S., DiForti, M., Taylor, H., … & Mondelli, V. (2012). Childhood maltreatment is associated with increased body mass index and increased c-reactive protein levels in first-episode psychosis patients. *Psychological Medicine,* 42, 1893-1901. doi:10.1017/S0033291711002947

Hobfoll, S. E. (1989). Conservation of Resources: A New Attempt at Conceptualizing Stress. *American Psychologist*, *44*, 513–524. doi:10.1037/0003-066X.44.3.513

Hobfoll S.E. (1998). Stress, culture, and community. New York: Plenum.

Hobfoll, S. E. (2002). Social and Psychological Resources and Adaptation. *Review of General Psychology*, *6*, 307–324. doi:10.1037/1089-2680.6.4.307

Hodges, M., Godbout, N., Briere, J., Lanktree, C., Gilbert, A., & Kletzka, N. T. (2013). Cumulative trauma and symptom complexity in children: A path analysis. *Child Abuse and Neglect*, *37*, 891–898. doi:10.1016/j.chiabu.2013.04.001

Hodgins, S. (2008)a. Violent behaviour among people with schizophrenia: a framework for investigations of causes, and effective treatment, and prevention. *Transactions of the Royal Society of London. Series B, Biological Sciences*, *363,* 2505–18. doi:10.1098/rstb.2008.0034

Hodgins, S., Cree, A., Alderton, J., & Mak, T. (2008)b. From conduct disorder to severe mental illness: associations with aggressive behaviour, crime and victimization. *Psychological Medicine*, *38,* 975-987. doi:10.1017/S0033291707002164

Hoffman, K. L., & Edwards, J. N. (2004). An integrated theoretical model of sibling violence and abuse. *Journal of Family Violence*, *26,* 1103-1130. doi:10.1177/0192513X05277809

Hoffman, K. L., Kiecolt, K. J, & Edwards, J. N. (2005). Physical violence between siblings: A theoretical and empirical analysis. *Journal of Family Issues, 26,* 1103-1130. doi: 10.1177/0192513X05277809

Holmes, M. R. (2013). Aggressive behavior of children exposed to intimate partner violence: An examination of maternal mental health, maternal warmth and child maltreatment. *Child Abuse and Neglect*, *37*, 520–530. doi10.1016/j.chiabu.2012.12.006

Hoy, K., Barrett, S., Shannon, C., Campbell, C., Watson, D., Rushe, T., … Mulholland, C. (2012). Childhood trauma and hippocampal and amygdalar volumes in first-episode psychosis. *Schizophrenia Bulletin*, *38*, 1162–1169. doi:10.1093/schbul/sbr085

Heron, J., O'Connor, T. G., Evans, J., Golding, J., Glover, V., & ALSPAC Study Team. (2004) The course of anxiety and depression through pregnancy and the postpartum in a community sample. *Journal of Affective Disorders, 80,* 65-73. doi: 10.1016/j.jad.2003.08.004.

Hoetger, L.A., Hazen, K.P. & Brank, E.M. (2015). All in the family: A retrospective study comparing sibling bullying and peer bullying. *Journal of Family Violence, 30,* 103-111. doi:10.1007/s10896-014-9651-0

Holtzman, C. W., Trotman, H. D., Goulding, S. M., Ryan, A. T., Macdonald, … & Walker, E. F. (2013). Stress and neurodevelopmental processing in the

emergence of psychosis. *Neuroscience,* 249, 172-191. doi:10.1016/j.neuroscience.2012.12.017

Horwood, J., Salvi, G., Thomas, K., Duffy, L., Gunnell, D., Hollis, C., Glyn, L., Menezes, P., Thompson, A., Wolke, D., Zammit, S., & Harrison, G. (2008). IQ and non-clinical psychotic symptoms in 12-year-olds: Results from the ALSPAC birth cohort. *British Journal of Psychiatry*, 193, 185–191. doi:10.1192/bjp.bp.108.051904

Houston, J. E., Shevlin, M., Adamson, G., & Murphy, J. (2011). A person-centred approach to modelling population experiences of trauma and mental illness. *Social Psychiatry and Psychiatric Epidemiology*, *46*, 149–157. doi:10.1007/s00127-009-0176-4

Howe, N., & Ross, H. S. (1990). Socialization, Perspective-Taking, and the Sibling Relationship. *Developmental Psychology*, *26*, 160–165. doi:10.1037/0012-1649.26.1.160

Howe, N., Aquan-Assen, J., Bukowski, W. M., Lehoux, P. M., Rinaldi, C. M. (2001). Siblings as confidents: emotional understanding, relationships warmth, and sibling disclosure. *Social Development, 10,* 439-454. doi:10.1111/1467-9507.00174

Howe, N., Recchia, R. (2005). Playmates and teachers: Reciprocal and complementary interactions between siblings. *Journal of Family Psychology, 19,* 497-502.

Howes, O. D & Murray, R. M. (2014). Schizophrenia: An integrated sociodevelopmental-cognitive model. *Lancet, 383,* 1677-1687. doi: 10.1016/S0140/6736(13)62036-X

Huesmann, L. R., Dubow, E. F., & Boxer, P. (2009). Continuity of aggression from childhood to early adulthood as a predictor of life outcomes: Implications for the adolescent-limited and life-course-persistent models. *Aggressive Behavior, 35,* 136-149. doi: 10.1002/ab.2030

Hughes, C., & Ensor, R. (2006). Behavioural problems in 2-year-olds: Links with individual differences in theory of mind, executive function and harsh

parenting. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *47*, 488–497. doi:10.1111/j.1469-7610.2005.01519.x

Kelleher, I., Harley, M., Lynch, F., Arseneault, L., Fitzpatrick, C., & Cannon, M. (2008). Associations between childhood trauma, bullying and psychotic symptoms among a school-based adolescent sample. *British Journal of Psychiatry, 193,* 378–382. doi:10.1192/bjp.bp.108.049536

Kennedy, D. E., & Kramer, L. (2008). Improving emotion regulation and sibling relationship quality: The more fun with sisters and brothers program. *Family Relations*, *57*, 567–578. doi:10.1111/j.1741-3729.2008.00523.x

Kennedy, J. L., Altar, C. A., Taylor, D. L., Degtiar, I., & Hornberger, J. C. (2014). The social and economic burden of treatment-resistant schizophrenia. *International Clinical Psychopharmacology, 29,* 63–76. doi:10.1097/YIC.0b013e32836508e6

Kempton, T., Armistead, L., Wierson, M., & Forehand, R. (1991). Presence of sibling as a potential buffer following parental divorce: An examination of young adolescents. *Journal of Clinical Child and Adolescent Psychology, 20,* 434-438. Doi: 10.1207/s15374424jccp2004_12

Khan, R., & Cooke, D. J. (2008). Risk factors for severe inter-sibling violence: A preliminary study of a youth forensic sample. *Journal of Interpersonal Violence, 23,* 1513-1530. doi: 10.1177/0886260508314312.

Khan R, Rogers P. (2015). The normalization of sibling violence: Does gender and personal experience of violence influence perceptions of physical assault against siblings? Journal of Interpersonal Violence, 30(3), 437-458. doi:10.1177/0886260514535095

Kilcommons, A. M., & Morrison, A. P. (2005). Relationships between trauma and psychosis: An exploration of cognitive and dissociative factors. *Acta Psychiatrica Scandinavica*, *112*, 351–359. doi:10.1111/j.1600-0447.2005.00623.x

Kim, J. E., Hetherington, E. M., & Reiss, D. (1999). Association among family relationships, antisocial peers, and adolescent externalizing behaviour:

Gender and family type differences. *Child Development, 70,* 1209-1230. doi:10.1111/1467-8624.00088

Kim, J. Y., McHale, S. M., Crouter, A. C., Osgood, D. W. (2007). Longitudinal linkages between sibling relationships and adjustment from middle childhood through adolescence. *Developmental Psychology, 43,* 960-973. doi:10.1037/0012-1649.43.4.960

Kim-Cohen, J., Moffitt, T. E., Taylor, A., Pawlby, S. K., & Caspi, A. (2005). Maternal depression and children's antisocial behaviour. Nature and nurture effects. *JAMA Psychiatry, 62,* 173-181. doi:10.1001/archpsyc.62.2.173

Klein, P. S., Feldman, R., & Zarur, S. (2002). Mediation in a sibling context: The relations of older siblings mediating behaviour and younger sibling's task performance. *Infant and Child Development, 11,* 321-333. doi:10.1002/icd.261

Klomek, A. B., Sourander, A., & Elonheimo, H. (2015). Bullying by peers in childhood and effects on psychopathology, suicidality, and criminality in adulthood. *Lancet Psychiatry, 2,* 930-941. doi:10.1016/S2215-0366(15)00223-0

Knack, J. M., Jensen-Campbell, L. A., & Baum, A. (2011). Worse than sticks and bones? Bullying is associated with altered hpa axis functioning and poor health. *Brain and Cognition,* 77, 183-190. doi:10.1016/j.bandc.2011.06.011

Koh, J. B., & Wong, J. S. (2017). Survival of the Fittest and the Sexiest: Evolutionary Origins of Adolescent Bullying. *Journal of Interpersonal Violence*, *32*, 2668–2690. doi:10.1177/0886260515593546

Kokkinos, C. M., & Panayiotou, G. (2004). Predicting bullying and victimization among early adolescents: Associations with disruptive behavior disorders. *Aggressive Behavior*, *30,* 520-533. doi:10.1002/ab.20055

Kolak, A. M., & Volling, B. L. (2013). Coparenting moderates the association between firstborn children's temperament and problem behavior across the transition to siblinghood. *Journal of Family Psychology*, *27*, 355–364. doi: 10.1037/a0032864

Kothari, R., Skuse, D., Wakefield, J., & Micali. N. (2013). Gender differences in the relationship between social communication and emotion recognition.

Journal of the American Academy of Child & Adolescent Psychiatry, 52, 1148-1157. doi:10.1016/j.jaac.2013.08.006

Kramer, L., & Radey, C. (1997). Improving sibling relationships among young children: A social skills training model. *Family Relations, 46*, 237–246. doi:10.2307/585121

Kramer, L., & Ramsburg, D. (2002). Advice given to parents on welcoming a second child: A critical review. *Family Relations, 51,* 2-14. National Council on Family Relations. doiL10.1111/j.1741-3729.2002.00002.x

Kramer, L. (2010). The essential ingredients of successful sibling relationships: An emerging framework for advancing theory and practice. *Child Development Perspectives, 4,* 80-86. doi:10.1111/j.1750-8606.2010.00122.x

Kretschmer, T., & Pike, A. (2009). Young children's sibling relationship quality: Distal and proximal correlates. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *50*, 581–589. doi:10.1111/j.1469-7610.2008.02016.x

Kretschmer, T., Hickman, M., Emond, A., Lewis, G., Macleod, J., Maughan, B., … Heron, J. (2014). Outcomes of childhood conduct problem trajectories in early adulthood: Findings from the alspac study. *European Child & Adolescent Psychiatry, 23,* 539-549. doi:10.1007/s00787-013-0488-5

Krienert, J. L., & Walsh, J. A. (2011). My Brother's Keeper: A Contemporary Examination of Reported Sibling Violence Using National Level Data, 2000-2005. *Journal of Family Violence*, *26*, 331–342. doi:10.1007/s10896-011-9367-3

Lam, C. B., Solmeyer, A. R., & McHale, S. M. (2012). Sibling relationships and empathy across the transition to adolescence, *Journal of Youth and Adolescence, 41,* 1657-1670. doi:10.1007/s10964-012-9781-8

Lardinois, M., Lataster, T., Mengelers, R., Van Os, J., & Myin-Germeys, I. (2011). Childhood trauma and increased stress sensitivity in psychosis. *Acta Psychiatrica Scandinavica*, *123,* 28–35. doi:10.1111/j.1600-0447.2010.01594.x

Layne, C. M., Greeson, J. K. P., Ostrowski, S. A., Kim, S., Reading, S., Vivrette, R. L., … Pynoos, R. S. (2014). Cumulative trauma exposure and high risk behavior in adolescence: Findings from the National Child Traumatic Stress Network Core Data Set. *Psychological Trauma: Theory, Research, Practice, and Policy*, *6*, S40–S49. doi:10.1037/a0037799

Legleye, S., Piontek, D., & Kraus, L. (2011). Psychometric properties of the cannabis abuse screening test (cast) in a french sample of adolescents. *Drug and Alcohol Dependence, 113,* 229-235. doi:10.1016/j.drugalcdep.2010.08.011

Leinonen, J. A., Solantaus, T. S., & Punamäki, R. L. (2003). Parental mental health and children's adjustment: The quality of marital interaction and parenting as mediating factors. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *44*, 227–241. doi:10.1111/1469-7610.t01-1-00116

Lereya, S. T., Copeland, W. E., Zammit, S., & Wolke, D. (2015). Bully/victims: a longitudinal, population-based cohort study of their mental health. *European Child & Adolescent Psychiatry, 24,* 1461–1471. doi.org/10.1007/s00787-015-0705-5

Levy, D. M. Studies in sibling rivalry. New York: The American Orthopsychiatry Association; 1937.

Levy, D. M. (1939). Sibling rivalry studies in children of primitive groups. *American Journal of Orthopsychiatry*, *9*, 205–214. doi:10.1111/j.1939-0025.1939.tb05585.x

Levy, D. M. (1941). V. The hostile act. *Psychological Review, 48,* 256–61. doi:10.1037/h0063597

Little, R. J. A., & Rubin, D. B. (2002). *Statistical Analysis with Missing Data*. 2nd ed. Wiley: New York, NY.

Loeber, R., Stouthamer-Loeber, M., Van Kammen, W.B. & Farrington, D.P. (1989). Development of a new measure of self-reported antisocial behavior for young children: prevalence and reliability. In M.W.Klein (Ed.) *Cross-national research in self-reported crime and delinquency*. (pp. 203-225) Dordrecht, Netherlands: Kluwer Academic Publishers.

Low, S., Shortt, J. W., & Snyder, J. (2012). Sibling influences on adolescent substance use: The role of modelling, collusion, and conflict. *Development and Psychopathology, 24,* 287-300. doi:10.1017/S0954579411000836

Marini, Z. A., Dane, A. V., & Kennedy, R. E. (2010). Multiple pathways to bullying: Tailoring educational practices to variations in students' temperament and brain function. In *The Developmental Relations among Mind, Brain and Education* (pp. 257–291). Springer Netherlands.

Mathis, G., & Mueller, C. (2015). Childhood sibling aggression and emotional difficulties and aggressive behaviour in adulthood. *Journal of Family Violence, 30,* 315-327. doi:10.1007/s10896-015-9670-5

McAlister, A. R., Peterson, C. C. (2013). Siblings, theory of mind, and executive functioning in children aged 3-6 years: New longitudinal evidence. *Child Development, 84,* 1442-1458. doi:10.1111/cdev.12043

McCrory, E., De Brito, S. A., & Viding, E. (2012) The link between child abuse and psychopathology: A review of neurobiological and genetic research. *Journal of the Royal Society of Medicine, 105,* 151-156. doi: 10.1258/jrsm.2011.110222

McGuire, S., McHale, S. M., & Updegraff, K. (1996). Children's perceptions of the sibling relationship in middle childhood: Connections within and between family relationships. *Personal Relationships, 3,* 229-239. doi:10.1111/j.1475-6811.1996.tb00114.x

McHale, S. M., & Crouter, A. C. (1996). The family contexts of children's sibling relationships. In G. H. Brody (Ed.), Sibling relationships: Their causes and consequences. (pp. 173–195). Ablex Publishing.

Milevsky, A. (2005). Compensatory patterns of sibling support in emerging adulthood: Variations in loneliness, self-esteem, depression and life satisfaction. *Journal of Social and Personal Relationships, 22,* 743-755. doi:10.1177/0265407505056447

Miller, N. E. (1941). I. The frustration-aggression hypothesis. *Psychological Review, 48,* 337-342. doi:10.1037/h0055861

Miller, L. E., Grabell, A., Thomas, A., Bermann, E., & Graham-Bermann, S. A. (2012). The associations between community violence, television violence, intimate partner violence, parent-child aggression, and aggression in sibling relationships of a sample of preschoolers. *Psychology of Violence*, *2*, 165–178. doi:10.1037/a0027254

Minnett, A., Vandell, D., & Santrock, J. (1983). The effects of sibling status on sibling interaction: Influence of birth order, age spacing, sex of child, and sex of sibling. *Child Development*, *54*, 1064–1072. doi:http://dx.doi.org/10.2307/1129910

Minuchin, P. (1985). Families and individual development: Provocations from the field of family therapy. *Child Development, 56,* 289–302. doi:10.1111/j.1467-8624.1985.tb00106.x

Menesini, E., Camodeca, M., & Nocentini, A. (2010). Bullying among siblings: the role of personality and relational variables. *British Journal of Developmental Psychology, 28*, 921–39. doi.org/10.1348/026151009X479402

Moffitt, T. E., Caspi, A., Rutter, M., & Silva, P. A. (2001). *Sex differences in antisocial behaviour.* Cambridge: Cambridge University Press.

Moffitt, T. E., & Caspi, A. (2001). Childhood predictors differentiate life-course persistent and adolescence-limited antisocial pathways among males and females. *Development and Psychopathology*, *13*, 355–372. doi: 10.1017/S0954579401002097

Moffitt, T. E. (2015). Life-course-persistent versus adolescence-limited antisocial behaviour. In T. R. McGee & P. Mazerolle (Eds.). *Developmental and Life-course Criminological Theories* (pp. 570-598). New York: Ashgate Publishing.

Moore, S. E., Norman, R. E., Sly, P. D., Whitehouse, A. J. O., Zubrick, S. R., & Scott, J. (2014). Adolescent peer aggression and its association with mental health and substance use in an Australian cohort. *Journal of Adolescence, 37,* 11-21. doi:10.1016/j.adolescence.2013.10.006

Moore, S. E., Norman, R. E., Suetani, S., Thomas, H. J., Sly, P. D., & Scott, J. G. (2017). Consequences of bullying victimization in childhood and adolescence: A systematic review and meta-anlaysis. *World Journal of Psychiatry, 7,* 60-76. doi:10.5498/wjp.v7.i1.60

Morandini, V.,& Ferrer, M. (2015). Sibling aggression and brood reduction: A review. *Ethology Ecology & Evolution, 27,* 2-16. Doi:10.1080/03949370.2014.880161

Morrill, M., Bachman, C., Polisuk, B., Kostelyk, K., & Wilson, S. (2018). An exploration of the relationship between experiences with sibling abuse and peer bullying: A pilot study. *Journal of Child & Adolescent Trauma,* 11, 113-120. doi:10.1007/s40653-017-0156-x

Murray, J., & Farrington, D. P. (2010). Risk factors for conduct disorder and delinquency: Key findings from longitudinal studies. *Canadian Journal of Psychiatry, 55,* 633-642. doi:10.1177/070674371005501003

Myin-Germeys, O., Delespaul, P., & van Os, J. (2005). Behavioral sensitization to daily life stress in psychosis. *Psychological Medicine, 35,* 733-741. doi:10.1017/S0033291704004179

Nansel, T. R., Overpeck, M., Pilla, R. S., Ruan, W. J., Simons-Morton, B., & Scheidt, P. (2001). Bullying behaviors among US youth: Prevalence and association with psychosocial adjustment. *Journal of the American Medical Association*, *285*, 2094–2100. doi:10.1001/jama.285.16.2094

Natsuaki, M. N., Ge, X., Reiss, D., & Neiderhiser, J. M. (2009). Aggressive behaviour between siblings and development of externalizing problems: Evidence from a genetically sensitive study. *Developmental Psychology, 45,* 1009-1018. doi:10.1037/a0015698

Noland, V. J., Liller, K. D., McDermott, R. J., Coulter, M. L., & Seraphine, A. E. (2004). Is adolescent sibling violence a precursor to college dating violence? *American Journal of Health Behaviour, 28,* S13-S23. doi:10.5993/AJHB.28.s1.3

Nowicki, S., & Duke, M. (1994). Individual differences in the nonverbal communication of affect: the diagnostic analysis of nonverbal accuracy scale. Journal of Nonverbal Behavior, *18*, 9-35. Doi:10.1007/BF02169077

Nowicki, S., & Strickland, B. R. (1973). A locus of control scale for children. *Journal of Consulting and Clinical Psychology, 63,* 148-154. Doi:10.1037/h0033978

O'Brien, R. (2007). A caution regarding rules of thumb for variance inflation factor. *Quality & Quantity, 41,* 673-690. doi: 10.1007/s11135-006-9018-6

Oh, W., Volling, B. L., & Gonzalez, R. (2015). Trajectories of children's social interactions with their infant sibling in the first year: A multidimensional approach. *Journal of Family Psychology*, *29*, 119–129. doi:10.1037/fam0000051

Olson, S. L., Lopez-Duran, N., Lunkenheimer, E. S., Chang, H., & Sameroff, A. J. (2011). Individual differences in the development of early peer aggression: Integrating contributions of self-regulation, theory of mind, and parenting. *Development and Psychopathology*, *23*, 253–266. doi:10.1017/S0954579410000775

Olweus, D. (1991). Bully/victim problems among schoolchildren: Basic facts and effects of a school based intervention program. In D. Pepler & K. Rubin (Eds.), The development and treatment of childhood aggression (pp. 441–448). Hillsdale, NJ: Erlbaum.

Olweus, D. (2007). *The Olweus Bullying Questionnaire*. Hazelden: Center City, MN.

Ostrov, J. M., Crick, N. R., & Stauffacher, K. (2006). Relational aggression in sibling and peer relationships during early childhood. *Journal of Applied Developmental Psychology*, *27*, 241–253. doi:10.1016/j.appdev.2006.02.005

Ouellet-Morin, I., Wong, C. C., Danese, A. Pariante, C. M., Papadopoulos, A. S., Mill, J., & Arseneault, L. (2013). Increased serotonin transporter gene (sert) dna methylation is associated with bullying victimization and blunted cortisol response to stress in childhood: a longitudinal study of discordant monozygotic twins. *Psychological Medicine, 43,* 1813-1823.

doi:10.1017/S0033291712002784

Patterson, G. R. (1967). Assertive behavior in children: A step toward a theory of aggression. *Monographs of the Society for Research in Child Development, 32*, 1-43.

Patterson, G. R. (1982). *Coercive family process*. Eugene, OR: Castalia.

Patterson, G. R., Dishion, T. J., & Bank, L. (1984). Family interaction: A process model of deviancy training. *Aggressive Behavior, 10,* 253-267. doi:10.1002/1098- 2337(1984)10:3<253::AID-AB2480100309>3.0.CO;2-2

Patterson, G. R. (1986). The contribution of siblings to training for fighting: A microsocial analysis. In D. Olweus, J. Block, & M. Radke- Yarrow (Eds.), *Development of antisocial and prosocial behavior: Research theories and issues* (pp. 235–261). New York, NY: Academic Press.

Patterson, G. R., Debaryshe, B., & Ramsey, E. (1990). A developmental perspective on antisocial behavior. *American Psychologist, 44,* 329-335. doi:101037/0003-066X.44.2.329

Perlman, M., & Ross, H. S. (1997). The Benefits of Parent Intervention in Children's Disputes: An Examination of Concurrent Changes in Children's Fighting Styles. *Child Development*, *68*, 690–700. doi:10.1111/j.1467-8624.1997.tb04230.x

Phillips, D. A., Bowie, B. H., Wan, D. C., & Yukevich, K. W. (2016). Sibling violence and children hospitalized for serious mental and behavioral health problems. *Journal of Interpersonal Violence,* 1-21. doi:10.1177/0886260516628289

Pickering, J. A., & Sanders, M. R. (2016). The protocol for a randomized controlled trial (RCT) of a brief intervention for parents of children experiencing sibling conflict. *Clinical Psychologist, 20,* 86-93. doi:10.1111/cp.12051.

Pickering, J. A., & Sanders, M. R. (2017). Integrating Parents' Views on Sibling Relationships to Tailor an Evidence-based Parenting Intervention for Sibling Conflict. *Family Process*, *56*, 105–125. doi:10.1111/famp.12173

Piotrowski, C. C., Tailor, K., & Cormier, D. C. (2014). Siblings exposed to intimate partner violence: linking sibling relationship quality & child adjustment

problems. *Child Abuse & Neglect, 38,* 123-134. doi:10.1016/j.chiabu.2013.08.005

Piotrowski, C. C., & Cameranesi, 2018. Aggression by children exposed to IPV: Exploring the role of child depressive symptoms, trauma-realted symptoms, & warmth in the family relationship. *Child Psychiatry & Human Development, 49,* 360-371. doi: 10.1007/s10578-017-0755-7.

Piquero, A. R., Gonzalez, J. M. R., & Jennings, W. G. (2015). Developmental trajectories and antisocial behaviour over the life-course. In J. Morizot & L. Kazemian (Eds.). *The Development of Criminal and Antisocial Behavior* (pp. 75-88). Switzerland: Springer International Publishing.

Punch, S. (2008). "You can do nasty things to your brothers and sisters without a reason": Siblings' backstage behaviour. *Children and Society, 22,* 333–344. doi:10.1111/j.1099-0860.2007.00119.x

Radford, L., Corral, S., Bradley, C., & Fisher, H. L. (2013). The prevalence and impact of child maltreatment and other types of victimization in the UK: Findings from a population survey of caregivers, children and young people and adults. *Child Abuse & Neglect, 37*, 801-813. doi:10.1016/j.chiabu.2013.02.004

Ralph, A., Tournbourou, J. W., Grigg, M., Mulcahy, R., Carr-Gregg, M., & Sanders, M. R. (2003). Early intervention to help parents manage behavioural and emotional problems in early adolescents: What parents want. *Australian E-Journal for the Advancement of Mental Health*, *2*, 156–168. doi:10.5172/jamh.2.3.156

Ram, A., Ross, H. S. (2001). Problem solving, contention, and struggle: How siblings resolve a conflict of interests. *Child Development, 72,* 1710-1722. doi:10.1111/1467-8624.00374

Read, J., Fosse, R., Moskowitz, A., & Perry, P. D. (2014). The traumagenic neurodevelopmental model of psychosis revisited. *Neuropsychiatry, 4,* 65-79. doi:10.2217/npy.13.89

Recchia, H. E., Howe, N. (2009). Associations between social understanding, sibling relationship quality, and sibling's conflict strategies and outcomes. *Child Development, 80,* 1564-1578. doi:10.1111/j.1467-8624.2009.01351.x.

Relva, I. C., Fernandes, O. M., & Mota, C. P. (2013). An exploration of sibling violence predictors. *Journal of Aggression, Conflict and Peace Research*, *5*, 47–61. doi:10.1108/17596591311290740

Ribeaud, D., & Eisner, M. (2010). Risk factors for aggression in pre-adolescence: Risk domains, cumulative risk and gender differences - results from a prospective longitudinal study in a multi-ethnic urban sample. *European Journal of Criminology*, *7*, 460–498. doi:10.1177/1477370810378116

Ross, H., Ross, M., Stein, N., & Trabasso, T. (2006). How siblings resolve their conflicts: The importance of first offers, planning, and limited opposition. *Child Development*, *77*, 1730–1745. doi:10.1111/j.1467-8624.2006.00970.x

Ruffman, T., Perner, J., Naito, M., Parkin, L., & Clements, W. A. (1998). Older (but not younger) siblings facilitate false belief understanding. *Developmental Psychology, 34,* 161–174. doi:10.1037/0012-1649.34.1.161

Russel, A. E., Ford, T., & Russell, G. (2018). The relationship between financial difficulty and childhood symptoms of attention deficit/hyperactivity disorder: a UK longitudinal cohort study. *Social Psychiatry and Psychiatric Epidemiology, 53*, 33-44. doi:10.1007/s00127-017-1453-2.

Salmivalli, C., Kaukianen, A., Kaisaniemi, L., & Lagerpetz, K. M. (1999). Self-evaluated self-esteem, peer-evaluated self-esteem, and defensive egotism as predictors of adolescent's participation in bullying situations. *Personality and Social Psychology Bulletin, 25,* 1268-1278. doi:10.1177/0146167299258008

Salmon, C. A. & Hehman, J. A. (2014) The evolutionary psychology of sibling conflict and siblicide. In Shackelford, T. K. & Hansen, R. D. (eds) *The Evolution of Violence*. (pp. 137-157). Springer, New York.

Schlomer, G. L., del Giudice, M., & Ellis, B. J. (2011). Parent-Offspring Conflict Theory: An Evolutionary Framework for Understanding Conflict Within

Human Families. *Psychological Review*, *118*, 496–521. doi:10.1037/a0024043

Schreier, A., Wolke, D., Thomas, K., Horwood, J., Hollis, C., Gunnell, D., Lewis, G., Thompson, A., Zammit, S., Duffy, L., Salvi, G., & Harrison, G. (2009). Prospective study of peer victimization in childhood and psychotic symptoms in a nonclinical population at age 12 years. *Archives of General Psychiatry, 66,* 527–36. doi:10.1001/archgenpsychiatry.2009.23

Selten, J., Cantor-Graae, E. (2005). Social defeat: Risk factor for schizophrenia? *British Journal of Psychiatry, 187,* 101-102. doi:10.1192/bjp.187.2.101

Selten, J. P., Van Der Ven, E., Rutten, B. P. F., & Cantor-Graae, E. (2013). The social defeat hypothesis of schizophrenia: An update. *Schizophrenia Bulletin*, *39*, 1180–1186. doi:10.1093/schbul/sbt134

Shetgiri, R., Lin, H., Avila, R. M., & Flores, G. (2012). Parental characteristics associated with bullying perpetration in us Children aged 10 to 17 years. *American Journal of Public Health*, *102*, 2280–2286. doi:10.2105/AJPH.2012.300725

Shevlin, M., Houston, J. E. Dorahy, M. J., & Adamson, G. (2008). Cumulative traumas and psychosis: An analysis of the national comorbidity survey and the british psychiatric morbidity survey. *Schizophrenia Bulletin, 34,* 193-199. doi:10.1093/schbul/sbm069

Shields, A., & Cicchetti, D. (2001). Parental maltreatment and emotion dysregulation as risk factors for bullying and victimization in middle childhood. *Journal of Clinical Child Psychology, 30,* 349-363. doi: 10.1207/S15374424JCCP3003_7

Siddiqui, A., & Ross, H. (2004). Mediation as a method of parent intervention in children's disputes. *Journal of Family Psychology, 18*, 147–159. doi:10.1037/0893-3200.18.1.147

Sims, E. N., Dodd, V. J., & Tejeda, M. (2008). The relationship between severity of violence in the home and dating violence. *Journal of Forensic Nursing, 4,* 166-173. doi:10.1111/j.1939-3938.2008.00028.x

Skinner, J. A., & Kowlaski, R. M. (2013). Profiles of sibling violence. *Journal of Interpersonal Violence, 28,* 1726-1736. doi:10.1177/0886260512468327

Skuse, D.H., James, R.S., Bishop, D.V.M., Coppin, B., Dalton, P., … & Jacobs, P.A. (1997). Evidence from Turner's syndrome of an imprinted X-linked locus affecting cognitive function. *Nature, 387*, 705-708. doi:10.1038/42706

Smith, T. E. (1993). Growth and academic achievement and teaching younger siblings. *Social Psychology Quarterly, 56,* 77-85. doi:10.2307/2786647

Smith, M. (2004), Parental mental health: disruptions to parenting and outcomes for children. Child & Family Social Work, 9: 3-11. doi:10.1111/j.1365-2206.2004.00312.x

Smith, J., & Ross, H. (2007). Training parents to mediate sibling disputes affects children's negotiation and conflict understanding. *Child Development, 78,* 790–805. doi:10.1111/j.1467-8624.2007.01033.x

Song, J. H., Volling, B. L., Lane, J. D., & Wellman, H. M. (2016). Aggression, sibling antagonism, and theory-of-mind during the first year of siblinghood: A developmental cascade model. *Child Development, 87,* 1250-1263. doi:10.1111/cdev.12530

Solmeyer, A. R., McHale, S. M., & Crouter, A. C. (2014). Longitudinal associations between sibling relationship qualities and risky behaviour across adolescence. *Developmental Psychology, 50,* 600-610. doi:10.1037/a0033207

Song, J. H., & Volling, B. L. (2015). Coparenting and children's temperament predict firstborns' cooperation in the care of an infant sibling. *Journal of Family Psychology*, *29*, 130–135. doi:10.1037/fam0000052

Song, J. Volling, B. L., Lane, J. D., Wellman, H. M. (2016). Aggression, sibling antagonism, and theory-of-mind during the first year of siblinghood: A developmental cascade model. *Child Development, 87,* 1250-1263. doi:10.1111/cdev.12530

Sourander, A., Gyllenberg, D., Klomek, A. B., Sillanmäki, L., Ilola, A. M., Kumpulainen, K. (2016). Association of bullying behaviour at 8 years of

age and use of specialized services for psychiatric disorders by 29 years of age. *JAMA Psychiatry, 73,* 159-165. doi:10.1001/jamapsychiatry.2015.2419

Smith, D. J., & McVie, S. (2003). Theory and method in the Edinburgh study of youth transitions and crime. *British Journal of Criminology, 43,* 169-195. doi:10.1093/bjc/43.1.169

Snyder, J., Bank, L., & Burraston, B. (2005). The consequences of antisocial behaviour in older male siblings for younger brothers and sisters. *Journal of Family Psychology, 19,* 643-653. doi:10.1037/0893-3200.19.4.643

Sourander, A., Jensen, P., Rönning, J. A., Niemelä, S., Helenius, H., Sillanmäki, L., … & Almqvist, F. (2007). What is the early adulthood outcome of boys who bully or are bullied in childhood? The finnish "from a boy to a man" study. *Pediatrics, 120,* 397-404. doi:10.1542/peds.2006-2704

Stocker, C. M., Lanthier, R. P., & Furman, W. (1997). Sibling relationships in early adulthood. *Journal of Family Psychology*, *11*, 210–221. doi:10.1037/0893-3200.11.2.210

Stocker, Clare M., Burwell, Rebecca A.,Briggs, & Megan L. Sibling conflict in middle childhood predicts children's adjustment in early adolescence. (2002). *Journal of Family Psychology, 16,* 50-57. doi: 10.1037/0893-3200.16.1.50

Stormshak, E. A., Bellanti, C. J., Bierman, K. L. (1996). The quality of sibling relationships and the development of social competence and behavioral control in aggressive children. *Developmental Psychology, 32,* 79-89. doi: 10.1037/0012-1649.32.1.79

Stormshak, E. A., Comeau, C. A., & Shepard, S.A. (2004). The relative contribution of sibling deviance and peer deviance in the prediction of substance use across middle childhood. *Journal of Abnormal Child Psychology, 32,* 635-649. doi:10.1023/B:JACP.0000047212.49463.c7

Stowkowy, J., & Addington, J. (2012). Maladaptive schemas as a mediator between social defeat and positive symptoms in young people at clinical high risk for psychosis. *Early Intervention in Psychiatry*, *6,* 87–90. doi:10.1111/j.1751-7893.2011.00297.x

Suliman, S., Mkabile, S. G., Fincham, D. S., Ahmed, R., Stein, D. J., & Seedat, S. (2009). Cumulative effect of multiple trauma on symptoms of posttraumatic stress disorder, anxiety, and depression in adolescents. *Comprehensive Psychiatry*, *50*, 121–127. doi:10.1016/j.comppsych.2008.06.006

Sutton, J., Smith, P. K., & Swettenham, J. (1999). Social cognition and bullying: Social inadequacy or skilled manipulation? *British Journal of Developmental Psychology, 17,* 435-450. doi: 10.1348/026151099165384

Swanson, J. W., Van Dorn, R. A., Swartz, M. S., Smith, A., Elbogen E. B., & Monahan, J. (2008). Alternative pathways to violence in persons with schizophrenia: The role of childhood antisocial behavior problems. *Law and Human Behavior, 32,* 228-240. doi:10.1007/s10979-007-9095-7

Tanrikulu, I. & Campbell, M. A. (2015). Sibling bullying perpetration: associations with gender, grade, peer perpetration, trait anger, and moral disengagement. *Journal of Interpersonal Violence, 30,* 1010-1024. doi:10.1177/0886260514539763

Tanskanen, A. O., Danielsbacka, M., Jokela, M. & Rotkirch, A. (2017). Sibling conflicts in full- and half-sibling households in the UK. *Journal of Biosocial Science, 49,* 31-37. doi:10.1017/S0021932016000043

Teti, D. M., & Ablard, K. E. (1989). Security of attachment and infant-sibling relationships: A laboratory study. *Child Development, 60*, 1519-1528. doi:10.2307/1130940

Thomson, R. M., Allely, C. S., Purves, D., Puckering, C., McConnachie, A., … & Wolson, P. (2014). Predictors of positive and negative parenting behaviours: evidence from the alspac cohort. *BMC Pediatrics, 14,* 1-10. doi:10.1186/1471-2431-14-247

Thomas, B. W., & Roberts, M. W. (2009). Sibling conflict resolution skills: Assessment and training. *Journal of Child & Family Studies, 18,* 447–453. doi:10.1007/s10826-008-9248-4

Tippett, N., & Wolke, D. (2015). Aggression between siblings: Associations with the home environment and peer bullying. *Aggressive Behavior, 41,* 14-24. doi:10.1002/ab.21557

Tremblay, R. E. (2004). Physical Aggression During Early Childhood: Trajectories and Predictors. *Pediatrics*, *114*, e43–e50. doi:10.1542/peds.114.1.e43

Trentacosta, C. J., & Fine, S. E. (2010). Emotion knowledge, social competence, and behavior problems in childhood and adolescence: A meta-analytic review. *Social Development*, *19*, 1–29. doi:10.1111/j.1467-9507.2009.00543.x

Trivers, R. L. (1974). Parent-offspring conflict. *Integrative and comparative biology, 14,* 249-264. doi:10.1093/icb/14.1.249

Trotta, A., Di Forti, M., Mondelli, V., Dazzan, P., Pariante, C., … & Fisher, H. L. (2013). Prevalence of bullying victimisation amongst first-episode psychosis patients and unaffected controls. *Schizophrenia Research, 150,* 1-17. doi:10.1016/j.schres.2013.07.001

Ttofi, M. M., Farrington, D. P., Lösel, F., & Loeber, R. (2011). The predictive efficiency of school bullying versus later offending: A systematic/meta-analytic review of longitudinal studies. *Criminal Behavior and Mental Health, 21,* 80-89. doi:10.1002/cbm.808

Ttofi, M. M., Farrignton, D. P., & Lösel, F. (2012). School bullying as a predictor of violence later in life: A systematic review and meta-analysis of prospective longitudinal studies. *Aggression and Violent Behavior, 17,* 405-418. doi:10.1016/j.avb.2012.05.002

Tucker, C. J., Updegraff, K. A., McHale, S. M., Crouter, A. C. (1999). Older siblings as socializers of younger sibling's empathy. *The Journal of Early Adolescence, 19,* 176-198. doi:10.1177/0272431699019002003

Tucker, J. C., McHale, S. M., & Crouter, A. C. (2008). Links between older and younger adolescent siblings' adjustment: The moderating role of shared activities. *International Journal of Behavioral Development*, *32*, 152–160. doi:10.1177/0165025407087214

Tucker, C. J., Finkelhor, D., Shattuck, A. M., & Turner, H. (2013)a. Prevalence and correlates of sibling victimization types. *Child Abuse & Neglect, 37,* 213–23. doi:10.1016/j.chiabu.2013.01.006.

Tucker, C. J., Finkelhor, D., Turner, H., Shattuck, A. (2013)b. Association of sibling aggression with child and adolescent mental health. *Pediatrics, 132,* 79-84. doi:10.1542/peds.2012-3801

Tucker, C. J., Finkelhor, D., Turner, H., Shattuck, A. M. (2014)a. Sibling and peer victimization in childhood and adolescence. *Child Abuse & Neglect, 38,* 1599-1606. doi:10.1016/j.chiabu.2014.05.007

Tucker, C. J, Finkelhor, D., Turner, H., & Shattuck, A. M. (2014)b. Family dynamics and young children's sibling victimization. Journal of Family Psychology, 28, 625–33. doi:10.1037/fam0000016

Tucker, C. J., Van Gundy, K. T., Wiesn-Martin, D., Sharp, E. H., Rebellon, C. J., & Stracuzzi, N. F. (2015). Proactive and reactive aggression and adjustment in adolescence. *Journal of Interpersonal Violence, 30*, 1-23. doi:10.1177/0886260514539760

Tucker, C. J., & Finkelhor, D. (2015). The state of interventions for sibling conflict and aggression. *Trauma, Violence, & Abuse, 18,* 396-406. doi:10.1177/1524838015622438

Tippett, N., & Wolke, D. (2015). Aggression between siblings: Associations with the home environment and peer bullying. *Aggressive Behavior, 41,* 14-24. doi:10.1002/ab.21557

Toseeb, U., McChesney, G., & Wolke, D. (2018). The prevalence and psychopathological correlates of sibling bullying in children with and without autism spectrum disorder. Journal of Autism and Developmental Disorders, in press. doi:10.1007/s10803-018-3484-2.

Updegraff, K. A, Thayer, S. M, Whiteman, S. D, Denning, D. J, & McHale, S. M. (2005). Relational aggression in adolescents' sibling relationships: links to sibling and parent–adolescent relationship quality. Family Relations, 54, 373–85. doi:10.1111/j.1741-3729.2005.00324.x

Valmaggia, L. R., Day, F., Garety, P., Freeman, D., Antley, A., Slater, M., … McGuire, P. (2015). Social defeat predicts paranoid appraisals in people at high risk for psychosis. *Schizophrenia Research*, *168*, 16–22. doi:10.1016/j.schres.2015.07.050

van Berkel, S. R., Tucker, C. J., & Finkelhor, D. (2018). The Combination of Sibling Victimization and Parental Child Maltreatment on Mental Health Problems and Delinquency. *Child Maltreatment*, *23*, 244–253. doi:10.1177/1077559517751670

Van Nierop, M., Dorsselaer, S., Bak, M., Mayin-Gremeys, I., & van Winkel, R. (2014). Does social defeat mediate the association between childhood trauma and psychosis? Evidence from the NEMESIS-2 study. *Acta Psychiatrica Scandinavica, 129,* 467-476. doi:10.1111/acps.12212

Varese, F., Smeets, F., Drukker, M., Lieverse, R., Lataster, T., Viechtbauer, W., Read, J., van Os, J., & Bentall, R. P. (2012). Childhood adversities increase the risk of psychosis: A meta-analysis of patient-control, prospective-and cross-sectional cohort studies. *Schizophrenia Bulletin*, *38*, 661–671. doi:10.1093/schbul/sbs050

Veenstra, R., Lindenberg, S., Oldehinkel, A. J., De Winter A. F., Verhulst, F. V., & Ormel, J. (2005). Bullying and victimization in elementary schools: a comparison of bullies, victims, bully/victims, and uninvolved preadolescents. *Developmental Psychology, 41,* 672-682. doi:10.1037/0012-1649.41.4.672

Volling, B. L., & Belsky, J. (1992). The Contribution of Mother-Child and Father-Child Relationships to the Quality of Sibling Interaction: A Longitudinal Study. *Child Development*, *63*, 1209–1222. doi:10.1111/j.1467-8624.1992.tb01690.x

Volling, B. L. (2001). Early Attachment Relationships as Predictors of Preschool Children's Emotion Regulation with a Distressed Sibling. *Early Education & Development*, *12*, 185–207. doi:10.1207/s15566935eed1202_2

Volling, B. L. (2012). Family transitions following the birth of a sibling: An empirical review of changes in the firstborn's adjustment. *Psychological Bulletin*, *138*, 497–528. doi:10.1037/a0026921

Volk, A. A., Camilleri, J. A., Dane, A. V., & Marini, Z. A. (2012). Is Adolescent Bullying an Evolutionary Adaptation? *Aggressive Behavior*, *38*, 222–238. doi:10.1002/ab.21418

Waldinger, R. J., Vaillant, G. E. & Orav, J. (2007). Childhood sibling relationships as predictor of major depression in adulthood: A 30-year prospective study. *The American Journal of Psychiatry, 164,* 949-945. doi:10.1176/ajp.2007.164.6.949

Wallace, M. T., Barry, C. T., Zeigler-Hill, V., & Green, B. A. (2012). Locus of Control as a Contributing Factor in the Relation Between Self-Perception and Adolescent Aggression. *Aggressive Behavior*, *38*, 213–221. doi:10.1002/ab.21419

Wechsler, D., Golombok, S., & Rust, J. (1992). *WISC-III UK Wechsler Intelligence Scale for Children*. Psychological Corp.: Sidcup.

Whitaker, R. C., Orzol, S. M., & Kahn, R. S. (2006). Maternal mental health, substance use, and domestic violence in the year after delivery and subsequent behaviour problems in children at age 3 years. *JAMA Psychiatry, 63,* 551-560. doi:10.1001/archpsyc.63.5.551

Whiteman, S. D., McHale, S. M., & Soli, A. (2011). Theoretical Perspectives on Sibling Relationships. *Journal of Family Theory & Review*, *3*, 124–139. doi: 10.1111/j.1756-2589.2011.00087.x

Winsper, C., Lerey, T., Zanarini, M., & Wolke, D. (2012). Involvement in bullying and suicide-related behavior at 11 years: a prospective birth cohort study. *Journal of the American Academy of Child and Adolescent Psychiatry, 51,* 271–282. e273. doi: 10.1016/j.jaac.2012.01.001.

Winsper, C. & Wolke, D. (2014). Infant and toddler crying, sleeping and feeding problems and trajectories of dysregulated behavior across childhood. *Journal of Abnormal Child Psychology, 42,* 831-843. doi:10.1007/s10802-013-9813-1

Wolke, D., Woods, S., Bloomfield, L., & Karstadt, L. (2001). Bullying involvement in primary school and common health problems. *Archives of Disease in Childhood*, *85*, 197–201. doi:/10.1136/adc.85.3.197

Wolke, D., & Samara, M. M. (2004). Bullied by siblings: Association with peer victimization and behaviour problems in Israeli lower secondary school

children. *Journal of Child Psychology and Psychiatry, 45,* 1015-1029. doi:10.1111/j.1469-7610.2004.t01-1-00293.x

Wolke, D., Waylen, A., Samara, M., Steer, C., Goodman, R., Ford, T., & Lamberts, K. (2009). Selective drop-out in longitudinal studies and non-biased prediction of behavioral disorders. *British Journal of Psychiatry*, 195, 249-256. doi:10.1192/bjp.bp.108.053751

Wolke, D., Skew, A. J. (2011). Bullied at home and at school: Relationship to Behaviour Problems and Unhappiness. In: McFall S, ed. Understanding society: Early findings from the first wave of the UKs household longitudinal study. London: Economic and Social Research Council.

Wolke, D., Copeland, W. E., Angold, A., & Costello, J. (2013). Impact of bullying in childhood on adult health, wealth, crime and social outcomes. *Psychological Science, 24,* 1958-1970. doi:10.1177/0956797613481608

Wolke, D., Lereya, S. T., Fisher, H. L., Lewis, G., & Zammit, S. (2014). Bullying in elementary school and psychotic experiences at 18 years: a longitudinal, population-based cohort study. *Psychological Medicine 44,* 2199–2211. doi:10.1017/S0033291713002912

Wolke, D., Tippett, N. & Dantchev, S. (2015)a Bullying in the family: sibling bullying. *The Lancet Psychiatry 2,* 917–929. doi:10.1016/S2215-0366(15)00262-X

Wolke, D., Bauman, N., Strauss, V., Johnson, S. & Marlow, N. (2015)b. Bullying of preterm children and emotional problems at school age: Cross-culturally invariant effects. *The Journal of Pediatrics, 166,* 1417-1422. doi:10.1016/j.jpeds.2015.02.055

World Health Organization (1994). Schedules for Clinical Assessment in Neuropsychiatry: American Psychiatric Research: Washington, DC.

Vaillancourt, T., Hymel, S., & McDougall, P. (2013). The Biological Underpinnings of Peer Victimization: Understanding Why and How the Effects of Bullying Can Last a Lifetime. *Theory into Practice, 52,* 241-248. doi.:10.1080/00405841.2013.829726

Van Berkel, S. R, Tucker, C. J., & Finkelhor, D. (2018). The combination of sibling victimization and parental child maltreatment on mental health problems and delinquency. *Child Maltreatment*, in press. doi:10.1177/1077559517751670.

Yu, J. J., & Gamble, W. C. (2008)a. Familial correlates of overt and relational aggression between young adolescent siblings. *Journal of Youth and Adolescence*, *37*, 655–673. doi:10.1007/s10964-007-9208-0

Yu, J. J., & Gamble, W. C. (2008)b. Pathways of influence: Marital relationships and their association with parenting styles and sibling relationship quality. *Journal of Child and Family Studies*, *17*, 757–778. doi:10.1007/s10826-008-9188-z

Yucel, D. & Yuan A. V. (2015). Do siblings matter? The effect of siblings on socio-emotional development and educational aspirations among early adolescents. *Child Indicators Research, 8,* 671-697. doi:10.1007/s12187-014-9268-0

Zammit, S., Kounali, D., Cannon, M., David, A. S., Gunnell, D., … & Lewis, G. (2013). Psychotic experiences and psychotic disorders at age 18 in relation to psychotic experiences at age 12 in a longitudinal population-based cohort study. *American Journal of Psychiatry*, 170, 742–750. doi:10.1176/appi.ajp.2013.12060768

APPENDICES

Appendix A

Frequencies of different types of sibling bullying victimisation and perpetration behaviours.

Type of bullying[a]	Victimisation, N (% of total sample)	Perpetration, N (% of total sample)
Hit, kicked, pushed, or shoved	1,015 (31.0)	760 (27.4)
Possessions damaged or taken	210 (6.4)	65 (2.4)
Called names	1,357 (41.3)	945 (33.9)
Made fun of	1,021 (31.3)	562 (20.5)
Ignored or left out of games or social groups	357 (11.0)	227 (8.2)
Told lies or spread rumours	270 (8.3)	54 (2.0)
Bullied in another way	126 (4.3)	42 (1.7)

[a]All types of sibling bullying are considered present if reported at least once a week.

Appendix B

Unadjusted Odds Ratios for Sibling Bullying Status at 12 Years According to Structural Family Characteristics

Precursors OR (95% CI)	Uninvolved	Victims	Bully-Victims	Bullies
First Born				
N=5,627 (%)	1,764 (43.5)	157 (29.2)	266 (42.0)	262 (65.5)
Unadjusted	Reference	**0.54 (0.44-0.65)****	0.94 (0.79-1.11)	**2.47 (1.99-3.06)****
Older Brothers				
N=5,627(%)	1,246 (30.7)	265 (49.3)	247 (39.0)	80 (20.0)
Unadjusted	Reference	**2.19 (1.83-2.63)****	**1.44 (1.21-1.72)****	**0.56 (0.44-0.73)****
Older Sisters				
N=5,627 (%)	1,351 (33.3)	183 (34.0)	175 (27.6)	73 (18.3)
Unadjusted	Reference	1.03 (0.85-1.25)	**0.77 (0.64-0.93)****	**0.45 (0.34-0.58)****
Number of Children				
N=5,518 (%)	1,245 (31.4)	212 (40.2)	272 (44.5)	156 (38.1)
Unadjusted	Reference	**1.47 (1.22-1.78)****	**1.76 (1.48-2.09)****	**1.35 (1.09-1.67)****
Single Mothers				
N=5,589 (%)	651 (16.2)	78 (14.4)	104 (16.7)	76 (18.9)
Unadjusted	Reference	0.87 (0.67-1.12)	1.04 (0.83-1.30)	1.21 (0.93-1.57)
Maternal Education (CSE or less)				
N=5,248 (%)	2,234 (59.1)	78 (55.6)	367 (62.6)	230 (59.7)
Unadjusted	Reference	0.87 (0.72-1.04)	1.16 (0.97-1.39)	1.03 (0.83-1.27)
Lower Social Class				
N=5,394 (%)	376 (9.7)	56 (10.9)	70 (11.8)	38 (9.7)
Unadjusted	Reference	1.15 (0.85-1.54)	1.25 (0.95-1.64)	1.01 (0.71-1.43)
> Financial Difficulties				
N=6,141	4,419	603	688	431
Unadjusted	Reference	**1.03 (1.01-1.06)****	**1.04 (1.02-1.07)****	1.01(0.98-1.04)

* = p<.05 ** = p<.01.

Appendix C

Unadjusted odds ratios for sibling bullying status at 12 years according to parental and parenting characteristics.

Precursors OR (95% CI)	Uninvolved	Victims	Bully-Victims	Bullies
Antenatal maternal depression				
N=6,125 (%yes)	4,413 (12.0)	598 (16.2)	683 (15.8)	431 (13.2)
Unadjusted	Reference	**1.42 (1.12-1.80)****	**1.38 (1.10-1.73)****	1.12 (0.84-1.50)
Antenatal maternal anxiety				
N=5,975 (%yes)	4,305 (13.9)	584 (18.5)	666 (16.8)	420 (15.5)
Unadjusted	Reference	**1.41 (1.12-1.77)****	**1.26 (1.01-1.57)***	1.14 (0.86-1.50)
Maternal psychiatric problems				
N=6,300 (%yes)	4,532 (9.0)	621 (9.3)	707 (11.5)	440 (12.0)
Unadjusted	Reference	1.04 (0.78-1.38)	**1.30 (1.02-1.68)***	**1.38 (1.02-1.87)***
Conflicting partnership				
N=5,074 (%)	3,629	510	577	358
Unadjusted	Reference	1.02 (0.97-1.07)	**1.16 (1.11-1.22)****	**1.07 (1.01-1.14)***
Domestic violence				
N= 4,879 (%yes)	828 (23.8)	136 (27.8)	190 (34.3)	84 (23.8)
Unadjusted	Reference	1.23 (1.00-1.52)	**1.67 (1.38-2.03)****	1.00 (0.77-1.29)
Maltreatment				
N=5,545 (%yes)	285 (7.1)	44 (8.1)	48 (7.8)	34 (8.7)
Unadjusted	Reference	1.15 (0.82-1.60)	1.10 (0.80-1.51)	1.23 (0.85-1.79)
Maternal bonding				
N= 5,428	3,889	540	608	391
Unadjusted	Reference	**0.98 (0.97-0.99)****	**0.97 (0.96-9.98)****	0.99 (0.97-1.00)
Mother-child activities				
N= 5,722	4,124	571	629	398
Unadjusted	Reference	**0.97 (0.95-1.00)***	**0.97 (0.94-1.04)****	1.01 (0.98-1.04)
Suboptimal parenting				
N=4,513	3,247	445	499	322
Unadjusted	Reference	0.96 (0.86-1.07)	1.11 (1.00-1.23)	**1.30 (1.15-1.48)****

* = p<.05 ** = p<.01.

Appendix D

Unadjusted Odds Ratios for Sibling Bullying Status at 12 Years According to Early Social Experiences.

Precursors	Sibling Bullying Status			
OR (95% CI)	Uninvolved	Victims	Bully-Victims	Bullies
Sibling aggression perpetration				
N= 5,301	3,788	534	605	374
Unadjusted	Reference	**1.28 (1.08-1.17)****	**1.15 (1.11-1.19)****	**1.14 (1.09-1.19)****
Sibling aggression victimisation				
N= 5,366	3,848	537	605	376
Unadjusted	Reference	**1.25 (1.17-1.34)****	**1.22 (1.14-1.30)****	0.93 (0.86-1.01)
> Time spent with sibling				
N=5,387	3,850	530	619	388
Unadjusted	Reference	1.00 (0.98-1.02)	**1.03 (1.01-1.06)****	**1.05 (1.02-1.08)****
Peer victimisation				
N=4,857	1,283 (35.9)	204 (43.7)	256 (45.8)	155 (43.9)
Unadjusted	Reference	**1.39 (1.14-1.69)****	**1.51 (1.26-1.81)****	**1.40 (1.12-1.75)****
Peer perpetration				
N=4,937	227 (6.4)	33 (7.1)	63 (11.3)	34 (9.8)
Unadjusted	Reference	1.12 (0.77-1.64)	**1.88 (1.40-2.52)****	**1.59 (1.09-2.33)***

* = p<.05 ** = p<.01.

Appendix E

Unadjusted Odds Ratios for Sibling Bullying Status at 12 Years According to Child Individual Differences

Precursors OR (95% CI)	Uninvolved	Victims	Bully-Victims	Bullies
Male				
N=6,838	2,653 (54.4)	379 (57.1)	437 (56.5)	181 (37.2)
Unadjusted	Reference	0.88 (0.75-1.04)	0.90 (0.77-1.05)	**1.98 (1.63-2.40)****
Very preterm/VLBW				
N=6,838 (%yes)	319 (6.5)	41 (6.2)	58 (7.5)	32 (6.6)
Unadjusted	Reference	0.95 (0.68-1.33)	1.17(0.87-1.56)	1.02 (0.70-1.48)
Difficult temperament				
N=5,931 (%yes)	612 (14.4)	109 (18.9)	118 (17.7)	73 (17.2)
Unadjusted	Reference	**1.36 (1.07-1.71)***	**1.28 (1.02-1.60)***	1.14 (0.86-1.51)
Regulatory problems				
N=6,408 (%yes)	4,609	626	721	452
Unadjusted	Reference	**1.08 (1.01-1.14)***	**1.13 (1.07-1.19)****	**1.07 (1.00-1.15)***
IQ				
N=5,188	3748	485	587	485
Unadjusted	Reference	1.00 (1.00-1.01)	**0.99 (0.99-1.00)****	1.00 (0.99-1.00)
Psychiatric disorders				
N=5,589 (%yes)	156 (3.9)	38 (7.3)	46 (7.6)	34 (8.2)
Unadjusted	Reference	**1.97 (1.26-2.84)****	**2.05 (1.46-2.88)****	**2.23 (1.51-3.27)****
Internalizing problems				
N=5,585	4025	535	629	396
Unadjusted	Reference	**1.08 (1.02-1.14)****	**1.12 (1.07-1.18)****	**1.08 (1.02-1.14)***
Externalizing problems				

Appendix E continued

Unadjusted Odds Ratios for Sibling Bullying Status at 12 Years According to Child Individual Differences

Precursors OR (95% CI)		Uninvolved	Victims	Bully-Victims
N=5,569	4009	535	628	535
Unadjusted	Reference	**1.05 (1.02-1.08)****	**1.11 (1.08-1.14)****	**1.14 (1.10-1.17)****
Poor emotion recognition				
N=4,751 (%yes)	735 (21.4)	115 (26.0)	119 (22.1)	84 (24.8)
Unadjusted	Reference	**1.29 (1.03-1.62)***	1.04 (0.84-1.30)	1.21 (0.93-1.57)
Social cognition				
N=5,402				
Unadjusted	Reference	1.04 (1.02-1.07)**	1.09 (1.06-1.11)**	1.11 (1.08-1.14)**
High self-esteem				
N=(4,837)	3496	454	539	348
Unadjusted	Reference	**0.94 (0.92-0.97)****	**0.96 (0.93-0.99)****	**0.95 (0.92-0.98)****
External locus of control				
N=(4,439)	3210	426	498	305
Unadjusted	Reference	**1.11 (1.05-1.62)****	**1.07 (1.03-1.12)****	1.02 (0.97-1.08)
Antisocial behaviour				
N=(4,952)	3580	464	561	347
Unadjusted	Reference	1.08 (0.95-1.22)	**1.32 (1.21-1.45)****	**1.36 (1.22-1.51)****

* = p<.05 ** = p<.01.

Appendix F

Variance Inflation Factors and Tolerance Levels Across Structural Family Characteristic

	VIF	Tolerance
Birth order	1.67	0.60
Older brother	1.64	0.61
Number of children in household	1.16	0.86
Financial difficulties	1.01	0.99

Appendix G

Variance Inflation Factors and Tolerance Levels Across Parent and Parenting Characteristic

	VIF	Tolerance
Maternal depression	1.55	0.64
Maternal anxiety	1.56	0.64
Maternal psychiatric disorders	1.06	0.94
Conflicting partnership	1.31	0.76
Maternal bonding	1.18	0.85
Maternal activities	1.07	0.93
Domestic violence	1.29	0.78
Suboptimal parenting	1.02	0.98

Appendix H

Variance Inflation Factors and Tolerance Levels Across Early Social Experiences

	VIF	Tolerance
Sibling victimisation	1.50	0.67
Sibling perpetration	1.48	0.67
Time spent together	1.03	0.98
Peer victimisation	1.08	0.93
Peer perpetration	1.08	0.93

Appendix I

Variance Inflation Factors and Tolerance Levels Across Child Individual Differences

	VIF	Tolerance
Sex	1.05	0.95
Temperament	1.10	0.91
Regulatory Problems	1.12	0.89
Psychiatric problems	1.24	0.80
Internalizing problems	1.11	0.90
Externalizing problems	1.50	0.66
Social cognition	1.61	0.62
Emotion recognition	1.03	0.97
Self-esteem	1.07	0.94
Locus of control	1.12	0.90
Antisocial behaviour	1.07	0.94

Appendix J

Variance Inflation Factors and Tolerance Levels Across all Variables Included in Model 5

	VIF	Tolerance
Birth order	1.83	0.55
Older brothers	1.63	0.62
Number of children in household	1.15	0.87
Financial difficulties	1.09	0.92
Conflicting partnership	1.30	0.77
Domestic violence	1.27	0.79
Maternal bonding	1.25	0.80
Suboptimal parenting	1.06	0.94
Sibling victimisation	1.95	0.51
Sibling perpetration	1.69	0.59
Sibling activities	1.18	0.85
Peer victimisation	1.13	0.89
Peer perpetration	1.19	0.84
Sex	1.06	0.95
Regulatory problems	1.14	0.87
Externalizing problems	1.56	0.64
Social cognition	1.47	0.68
Self-esteem	1.10	0.91
Locus of control	1.08	0.93
Antisocial behaviour	1.15	0.87

Appendix K

Odds Ratios for High-Risk Behaviour which Sibling Bullying Perpetrators were Most Often Involved in.

High-Risk Behaviours OR (95% CI)	Sibling Bullying Status			
	Uninvolved	Victim	Bully	Bully-Victim
Antisocial Behaviour				
Been rowdy/rude in public	Reference	0.74 (0.53-1.03)	**1.94 (1.45-2.60)**	**1.37 (1.45-1.77)**
Taken/driven a vehicle without permission	Reference	1.30 (0.58-2.92)	1.03 (0.37-2.90)	**2.53 (1.41-4.55)**
Hit, kicked or punched someone with intention of hurting them	Reference	**1.44 (1.01-2.04)**	**2.51 (1.79-3.52)**	**1.57 (1.15-2.15)**
Deliberately damaged/destroyed property	Reference	1.30 (0.78-2.17)	**2.07 (1.26-3.38)**	**1.71 (1.12-2.63)**
Hurt/injured animals/birds on purpose	Reference	0.59 (0.14-2.46)	2.06 (.079-5.41)	**2.73 (1.34-5.56)**
Carried a knife/weapon for protection or in case it was needed for a fight	Reference	**2.16 (1.13-4.13)**	**2.51 (1.25-5.05)**	**1.95 (1.04-3.65)**
Criminal Involvement				
In trouble with the police	Reference	0.81 (0.56-1.19)	**1.63 (1.12-2.38)**	1.20 (0.87-1.66)
Illicit Drug Use				
Cocaine	Reference	0.87 (0.53-1.42)	**1.80 (1.14-2.84)**	1.05 (0.68-1.62)

Bold = $p<.05$.

OR = Odds ratio. CI = Confidence intervals.

Appendix L

Unadjusted Odds Ratios for Birth-Order Effects of Hhigh-Risk Behaviour According to Sibling Bullying Status

Outcome OR (95% CI)	Sibling Bullying Status			
	Uninvolved	Victim	Bully	Bully-Victim
Antisocial Behaviour				
First-Born	Reference	1.11 (0.71-1.72)	**1.97 (1.41-2.73)**	1.35 (0.98-1.88)
Later-Born	Reference	0.95 (0.69-1.29)	1.55 (0.97-2.47)	1.43 (1.07-1.92)
Criminal Involvement				
First-Born	Reference	0.74 (0.35-1.57)	**1.99 (1.24-3.19)**	1.09 (0.64-1.85)
Later-Born	Reference	0.65 (0.34-11.09)	0.98 (0.43-2.23)	1.33 (0.86-2.05)
Alcohol Use				
First-Born	Reference	1.07 *0.71-1.62)	1.14 (0.82-1.59)	1.12 (0.82-1.53)
Later-Born	Reference	1.14 (0.86-1.50)	1.56 (0.96-2.53)	1.49 (1.11-2.01)
Illicit Drug Use				
First-Born	Reference	1.05 (0.66-1.68)	**1.68 (1.18-2.38)**	1.38 (0.98-1.94)
Later-Born	Reference	1.20 (0.89-1.61)	1.05 (0.64-1.73)	1.47 (1.10-1.97)
Nicotine Dependence				
First-Born	Reference	1.27 (0.16-10.17)	3.10 (0.94-10.20)	**4.22 (1.48-12.02)**
Later-Born	Reference	1.11 (0.42-2.91)	sample too small (N=0)	0.95 (0.33-2.75)
Cannabis Use				
First-Born	Reference	sample too small (N=0)	1.42 (0.52-3.90)	2.80 (1.23-6.4)
Later-Born	Reference	0.53 (0.19-1.50)	0.80 (0.19-3.41)	0.99 (0.43-2.24)

OR = Odds ratio. CI = Confidence intervals.

Bold = p<.0083 (Bonferroni Correction).

Appendix M

Odds Ratios for High-Risk Behaviour which Sibling and Peer Bullying Perpetrators are Most Often Involved in

High-Risk Behaviour OR (95% CI)	Sibling and/or Peer Bullying Perpetration		
	Uninvolved	Either	Both
Antisocial Behaviour			
Been rowdy/rude in public	Reference	**1.45 (1.17-1.81)**	**3.36 (2.24-5.03)**
Hit, kicked or punched someone with intention of hurting them	Reference	**1.91 (1.46-2.49)**	**3.03 (1.84-4.97)**
Deliberately damaged/destroyed property	Reference	**1.88 (1.31-2.71)**	**3.98 (2.19-7.23)**
Carried a knife/weapon for protection or in case it was needed for a fight	Reference	**1.88 (1.12-3.14)**	**2.77 (1.08-7.12)**
Used a cheque book/credit card/cash which you knew/suspected of being stolen	Reference	0.95 (0.20-4.46)	**9.46 (2.48-36.16)**
Criminal Involvement			
In trouble with the police	Reference	1.24 (0.95-1.63)	**1.88 (1.07-3.32)**
In trial in court	Reference	1.99 (0.60-6.63)	**7.27 (1.52-34.85)**
Took part in a mediation process	Reference	3.97 (0.58-28.23)	**14.38 (1.31-162.62)**
Illicit Drug Use			
Cocaine	Reference	**1.59 (1.14-2.21)**	**2.28 (1.18-4.40)**

Bold = $p<.05$.

OR = Odds ratio. CI = Confidence intervals.

Appendix N

Individual and Family Characteristics of Sibling Bullying Victims and Perpetrators.

	Never % or M (SD)	Only Ever Once or Twice % or M (SD)	2 or 3 Times a Month % or M (SD)	About Once a Week % or M (SD)	Several Times a Week % or M (SD)	*P*
Victimisation (N)	3636	1190	645	662	783	
Male	49	44.3	45.7	41.1	44.6	**<.001**
IQ	105.95 (15.9)	105.30 (16.95)	105.67 (15.63)	104.54 (16.38)	103.75 (16.45)	**.031**
Internalizing Problems	1.44 (1.61)	1.51 (1.71)	1.47 (1.68)	1.69 (1.69)	1.75 (1.77)	**<.001**
Externalizing Problems	1.41 (1.39)	1.58 (1.40)	1.61 (1.45)	1.71 (1.48)	1.96 (1.60)	**<.001**
Peer Perpetration[a]	6.7	5.5	8.6	8.9	9.7	**<.05**
Peer Victimisation[a]	35.5	39.9	37.3	43.7	45.9	**<.001**
Psychiatric Diagnosis	4.3	4.3	4.1	5.5	9.1	**<.001**
First-born	50.2	36.4	34.9	37.3	34.8	**<.001**
Single-mother	16.5	17	15.4	14.9	16.3	>.250
Children at Home (%>=3)	28.9	37.4	39.5	40	44.8	**<.001**
Older Brother	25.9	36.1	40.2	40.2	47.2	**<.001**
Older Sister	30.9	35.3	32.6	32	29.4	>.250
Maternal Education (>CSE)	60.1	59	54.9	57.1	61.4	.336
Maternal Depression	6.26 (4.53)	6.34 (4.40)	6.55 (4.48)	7.01 (4.77)	7.07 (4.74)	**<.001**
Maltreatment	11.8	12.6	13.3	12.4	16.2	**.010**
Domestic Violence	16.7	19.5	20.7	22.1	2.5	**<.001**
Perpetration (N)	4072	841	697	673	598	
Male	47.2	39.0	43.8	49.8	52.8	>.250
IQ	105.58 (16.17)	105.66 (15.75)	107.18 (15.83)	104.71 (16.29)	103.21 (17.17	**.003**
Internalizing Problems	1.41 (1.59)	1.56 (1.79)	1.69 (1.70)	1.69 (1.71)	1.78 (1.85)	**<.001**

Appendix N

Individual and Family Characteristics of Sibling Bullying Victims and Perpetrators.

	Never % or M (SD)	Only Ever Once or Twice % or M (SD)	2 or 3 Times a Month % or M (SD)	About Once a Week % or M (SD)	Several Times a Week % or M (SD)	*P*
Externalizing Problems	1.37 (1.35)	1.61 (1.50)	1.76 (1.43)	1.84 (1.46)	2.11 (1.65)	**<.001**
Peer Perpetration[a]	6.4	5.1	8.3	9.2	12.7	**<.001**
Peer Victimisation[a]	36.1	38.3	38.4	41.8	49.3	**<.001**
Psychiatric Diagnosis	4.0	5.7	3.8	6.6	9.6	**<.001**
First-born	39.1	47.4	51.6	50.7	51.9	**<.001**
Single-mother	15.9	15.5	17.1	17.8	17.7	.177
Children at Home (%>=3)	30.6	35.5	39	39.8	44.1	**<.001**
Older Brother	35.5	26.7	24.8	31	31.9	**<.001**
Older Sister	34.2	32.6	29.5	25.2	22.9	**<.001**
Maternal Education (>CSE)	59.1	57.7	57.4	60.3	63.1	>.250
Maternal Depression	6.39 (4.52)	6.24 (4.54)	6.41 (4.48)	6.85 (4.77)	6.87 (4.77)	**.025**
Maltreatment	11.7	13.8	14.3	13.7	14.4	**<.001**
Domestic Violence	17.4	19.0	20.0	24.1	24.9	**<.001**

[a] Peer bullying perpetration and victimisation measures were obtained at 8 years.

Appendix O

Dropout Analysis with Regard to Availability of PLIKS Interview[a]

Characteristics	PLIKS Interview available, N (%) or M (SD)	PLIKS Interview Not Available, N (%) or M (SD)	Unavailable vs. Available	*p*
Gender				
Female	2068 (55.4)	1665 (44.6)	Reference	
Male	1527 (47.0)	1724 (53.0)	**1.40 (1.28-1.54)**	**<.001**
Birth Order				
First Born	1397 (55.9)	1102 (44.1)	Reference	
Later Born	1709 (52.6)	1539 (47.4)	**1.14 (1.02-1.27)**	**.013**
Marital Status				
Married	2684 (56.2)	2095 (43.8)	Reference	
Single	435 (46.5)	501 (53.5)	**1.48 (1.28-1.70)**	**<.001**
Children at Home				
<=2	2053 (55.3)	1657 (44.7)	Reference	
>=3	1047 (54.4)	876 (45.6)	1.04 (0.93-1.16)	>.250
Older Brother				
No	2125 (54.9)	1747 (45.1)	Reference	
Yes	981 (52.3)	894 (47.7)	1.11 (0.99-1.24)	.068
Older Sister				
No	2152 (54.9)	1767 (45.1)	Reference	
Yes	954 (52.2)	874 (47.8)	1.16 (1.00-1.25)	.054
Maternal Education				
O-Levels or more	1331 (60.9)	855 (39.1)	Reference	
CSE or less	1667 (52.5)	1506 (47.5)	**1.41 (1.26-1.57)**	**<.001**

Appendix O continued

Dropout Analysis with Regard to Availability of PLIKS Interview[a]

Characteristics		PLIKS Interview available, N (%) or M (SD)	PLIKS Interview Not Available, N (%) or M (SD)	Unavailable vs. Available	*p*
Bullied by Peers[a]					
No	2604 (61.4)	1639 (38.6)	Reference		
Yes	486 (59.2)	335 (40.8)	1.10 (0.94-1.28)	.242	
Maltreatment					
No	2495 (54.9)	2053 (45.1)	Reference		
Yes	419 (56.9)	317 (43.1)	0.92 (0.79-1.08)	>.250	
Domestic Violence					
No	2335 (55.4)	1880 (44.6)	Reference		
Yes	566 (50.5)	554 (49.5)	**1.22 (1.07-1.39)**	**.004**	
Sibling Bullying Victimisation					
Never	1848 (50.9)	1786 (49.1)	Reference		
Only ever once or twice	626 (52.6)	564 (47.4)	0.93 (0.82-1.06)	>.250	
2 or 3 times a month	333 (51.6)	312 (48.4)	0.97 (0.82-1.15)	>.250	
About once a week	363 (54.9)	298 (45.1)	0.85 (0.72-1.00)	.055	
Several times a week	388 (49.6)	395 (50.4)	1.05 (0.90-1.23)	>.250	
Sibling Bullying Perpetration					
Never	2092 (51.4)	1976 (48.6)	Reference		
Only ever once or twice	440 (52.3)	401 (47.7)	0.97 (0.83-1.12)	>.250	
2 or 3 times a month	384 (55.1)	313 (44.9)	0.86 (0.73-1.01)	.074	
About once a week	349 (51.9)	323 (48.1)	0.98 (0.83-1.15)	>.250	
Several times a week	277 (46.4)	320 (53.6)	**1.22 1.02-1.45)**	**.022**	

Appendix O continued

Dropout Analysis with Regard to Availability of PLIKS Interview[a]

Characteristics	PLIKS Interview available, N (%) or M (SD)	PLIKS Interview Not Available, N (%) or M (SD)	Unavailable vs. Available	*p*
Sibling Bullying Status				
None	2537 (51.6)	2376 (48.4)	Reference	
Victim	364 (54.8)	300 (45.2)	0.88 (0.75-1.04)	.124
Bully	236 (48.6)	250 (51.4)	1.13 (0.94-1.36)	.195
Bully-Victim	384 (49.8)	387 (50.2)	1.08 (0.92-1.25)	>.250
Maternal Post-Natal Depression	6.22 (4.43)	6.74 (4.68)	**1.03 (1.01-1.04)**	**<.001**
IQ	107.83 (16.09)	101.67 (15.73	**0.98 (0.97-0.98)**	**<.001**
Internalizing Problems	1.53 (1.67)	1.49 (1.67)	0.99 (0.96-1.02)	>.250
Externalizing Problems	1.51 (1.43)	1.60 (1.46)	**1.04 (1.01-1.08)**	**.019**

[a] Peer bullying perpetration and victimisation measures were obtained at 8 years.

Appendix P

Association Between Sibling and Peer Bullying at 12 Years (OR, 95% CI)

	Peer Bullying		
	Pure Victim	Pure Bully	Bully-Victim
Sibling Bullying			
Neutral	1	1	1
Pure Victim	**1.33 (1.04-1.71)***	1.42 (0.79-2.53)	1.28 (0.84-1.97)
Pure Bully	**1.42 (1.06-1.90)***	**2.74 (1.62-4.66)****	**3.42 (2.40-4.87)****
Bully-Victim	**1.86 (1.49-2.33)****	**2.50 (1.56-4.00)****	**4.17 (3.13-5.56)****

Reference group: Neutral peer bullying status.

*p<0.05 **p<.01 ***p<.001.

Appendix Q

Prevalence and Odds Ratios of Psychotic Disorder at Age 18 According to Sibling Bullying Victimisation and Perpetration at Age 12: Sensitivity Analysis Including PLIKSi at 12 Years as a Control Variable.

Sibling Bullying	Frequency of Sibling Bullying					
	Never	Only Ever Once or Twice	2 or 3 Times a Month	About Once a Week	Several Times a Week	Linear Trend
Victimisation (N=3,559)	1,849	626	333	363	388	
% yes	1.1	1.4	0.9	2.8	3.1	
Unadjusted OR (95% CI)	Reference	1.33 (0.60-2.95)	0.83 (0.25-2.81)	**2.59 (1.20-5.58)***	**2.92 (1.41-6.02)****	**1.31 (1.11-1.56)****
Imputed Adjusted[a] OR (95% CI)	Reference	1.18 (0.52-2.67)	0.74 (0.21-2.57)	2.23 (1.00-5.00)	**2.43 (1.11-5.29)***	**1.26 (1.05-1.51)***
Perpetration (N=3,546)	2,096	440	384	349	277	
% yes	1.0	1.4	2.6	2.3	3.3	
Unadjusted OR (95% CI)	Reference	1.44 (0.57-3.59)	**2.78 (1.29-5.98)****	**2.44 (1.06-5.57)***	**3.49 (1.57-7.73)****	**1.37 (1.15-1.63)****
Imputed Adjusted[a] OR (95% CI)	Reference	1.28 (0.50-3.29)	**2.49 (1.12-3.53)***	2.17 (0.90-5.21)	**3.05 (1.29-7.22)***	**1.32 (1.10-1.63)****

[a] Includes family characteristics and factors associated with psychosis as confounders.

Significant confounders:

Victimisation=male gender, lower maternal education, single marital status, maltreatment present, pliks at 12 years present.

Perpetration=male gender, lower maternal education, single marital status, maltreatment present, pliks at 12 years present.

*p<.05 **p<.01.

Appendix R

Prevalence and Odds Ratios of Psychotic Disorder at Age 18 According to Sibling Bullying Status at Age 12: : Sensitivity Analysis Including PLIKSi at 12 Years as a Control Variable.

	Sibling Bullying Status			
	Non-Involved	Pure Victim	Pure Bully	Bully-Victim
Bullying Involvement (N=3,522)	2,538	364	236	384
%yes	1.0	3.0	2.5	2.9
Unadjusted OR (95% CI)	Reference	**3.13 (1.53-6.42)****	**2.62 (1.06-6.46)***	**2.96 (1.45-6.07)***
Imputed Adjusted[a] OR (95% CI)	Reference	**2.82 (1.33-5.95)****	2.51 (0.97-6.52)	**2.60 (1.20-5.64)***

[a] Includes family characteristics and factors associated with psychosis as confounders.

Significant confounders: =male gender, lower maternal education, single marital status, maltreatment present, pliks at 12 years present.

**p*<.05 ***p*<.01.

Appendix S

Prevalence and Odds Ratios of Psychotic Disorder at Age 18 According to Sibling and/or Peer Victimisation at Age 12: Sensitivity Analysis Including PLIKSi at 12 Years as a Control Variable.

	Non-Involved	Sibling OR Peer	Sibling AND Peer	Linear Trend
Psychotic Disorder (N=3,171)	1,957	1,015	199	
% yes	0.8	2.2	3.5	
Unadjusted OR (95% CI)	Reference	**2.87 (1.48-5.55)****	**4.72 (1.90-11.72)****	**2.28 (1.51-3.44)****
Imputed Adjusted[a] OR (95% CI)	Reference	**2.43 (1.22-4.82)***	**3.42 (1.30-8.98)***	**1.93 (1.24-3.01)***

[a] Includes family characteristics and factors associated with psychosis as confounders.

Significant confounders: = lower maternal education, single marital status, pliks at 12 years present.

*p<.05 **p<.01.